DOCTORAL THESIS

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INTERNATIONAL DOCTORAL SCHOOL

Doctoral Programme in Social Science

Sensory Marketing Evaluation of E-Commerce Websites with Artificial Intelligence

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AUTHORIZATION OF THE DIRECTORS OF THE THESIS FOR SUBMISSION

Prof. Dr. Rüdiger Buchkremer and Prof. Dr. Laura Campoy Gómez as Directors[1] of the Doctoral Thesis "Sensory Marketing Evaluation of E-Commerce Websites with Artificial Intelligence" by Mr. Kevin Hamacher in the Programa de Doctorado en Ciencias Sociales, **authorizes for submission** since it has the conditions necessary for his defense.

Sign to comply with the Royal Decree 99/2011, in Murcia, September 6, 2023.

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ABSTRACT

This dissertation explores the relevance and challenges of sensory marketing in the online domain, with a specific focus on e-commerce. As the shift from traditional brick-and-mortar retail to sensory-limited online shopping continues, businesses face the task of effectively engaging consumers in online environments. Moreover, the intensifying competition adds pressure on companies to provide a unique online consumer journey, making sensory marketing crucial in the e-commerce landscape. The growing research field on enhancing online shopping experiences through sensory stimulation highlights the increasing significance. To address this topic, this work employs design science research methodology to develop an automated assessment approach for evaluating online sensory marketing efforts. Initially, the research scope is established by semi-structured expert interviews (SSIs). The knowledge base is constructed by applying artificial intelligence, a systematic literature review, and insights gathered from the SSIs. The developed assessment approach, named as the online sensory marketing index (OSMI), is prototyped by a two-step process. Firstly, a manual assessment framework (Artifact I) is created based on input from SSIs and a survey, following confirmation of the business need. Hence, the options of automating online sensory assessments are explored using machine learning and artificial intelligence techniques, encompassing retrieval, (pre-) processing, and evaluation of sensory components such as texts, images, videos, audio, and interactive online content. The results obtained serve as the foundation for developing a prototype OSMI application mock-up (Artifact II), aligning with the requirements of its intended implementation environment. Subsequently, the OSMI automatic assessment approach is evaluated through additional SSIs to present the developed solution, gather expert opinions, and assess its suitability for business-world implementation. This dissertation demonstrates that the OSMI assessment, based on computer-assisted analyses of sensory e-commerce content, represents a valuable tool for marketing professionals. The evaluation includes a user experience analysis, comparing the manual OSMI assessment with the developed mock-up. The comparison reveals a significant improvement in perceived efficiency, a key element for the adoption of new tools in the business context.

KEY WORDS

Sensory Marketing; Design-Science-Research, Online Sensory Marketing Index; E-commerce; Assessment System; Sensory Imagery; Online Consumer Experience, Big Data; Automatic Evaluation; Natural Language Processing; Text Mining; TF-IDF; BERT; GloVe; Word2Vec; Scoring

RESUMEN

Esta disertación explora la relevancia y los desafíos del marketing sensorial en el ámbito en línea, con un enfoque específico en el comercio electrónico. A medida que la transición del comercio minorista tradicional de ladrillo y mortero a las compras en línea limitadas sensorialmente continúa, las empresas se enfrentan a la tarea de involucrar eficazmente a los consumidores en entornos en línea. Además, la intensificación de la competencia agrega presión a las empresas para proporcionar un viaje único del consumidor en línea, lo que hace que el marketing sensorial sea crucial en el panorama del comercio electrónico. El creciente campo de investigación sobre la mejora de las experiencias de compra en línea a través de la estimulación sensorial destaca su creciente importancia. Para abordar este tema, este trabajo utiliza la metodología de investigación de ciencia del diseño para desarrollar un enfoque de evaluación automatizado para evaluar los esfuerzos de marketing sensorial en línea. Inicialmente, el alcance de la investigación se establece mediante entrevistas semiestructuradas a expertos (SSI). La base de conocimientos se construye aplicando inteligencia artificial, una revisión sistemática de la literatura y conocimientos recopilados de las SSI. El enfoque de evaluación desarrollado, denominado índice de marketing sensorial en línea (OSMI), se prototipa mediante un proceso de dos pasos. En primer lugar, se crea un marco de evaluación manual (Artifact I) basado en la información de las SSI y una encuesta, siguiendo la confirmación de la necesidad empresarial. Por lo tanto, se exploran las opciones de automatizar las evaluaciones sensoriales en línea utilizando técnicas de aprendizaje automático e inteligencia artificial, que abarcan la recuperación, el (pre)procesamiento y la evaluación de componentes sensoriales como textos, imágenes, videos, audio y contenido en línea interactivo. Los resultados obtenidos sirven como base para desarrollar una maqueta de aplicación OSMI (Artifact II), que se ajusta a los requisitos de su entorno de implementación previsto. Posteriormente, se evalúa el enfoque de evaluación automática OSMI a través de SSI adicionales para presentar la solución desarrollada, recopilar opiniones de expertos y evaluar su idoneidad para la implementación en el mundo empresarial. Esta disertación demuestra que la evaluación OSMI, basada en

análisis asistidos por computadora del contenido sensorial del comercio electrónico, representa una herramienta valiosa para los profesionales del marketing. La evaluación incluye un análisis de la experiencia del usuario, comparando la evaluación manual OSMI con la maqueta desarrollada. La comparación revela una mejora significativa en la eficiencia percibida, un elemento clave para la adopción de nuevas herramientas en el contexto empresarial.

PALABRAS CLAVE

Marketing sensorial; investigación de ciencia del diseño, índice de marketing sensorial en línea; comercio electrónico; sistema de evaluación; imágenes sensoriales; experiencia del consumidor en línea; big data; evaluación automática; procesamiento del lenguaje natural; minería de texto; TF-IDF; BERT; GloVe; Word2Vec; puntuación.

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ACRONYMS AND ABBREVIATIONS

AI, Artificial Intelligence

API, Application Programming Interface

AR, Augmented Reality

AVE, Average Variance Extracted

AWS, Amazon Web Services

BERT, Bidirectional Encoder Representations from Transformers

CR, Composite Reliability

CFA, Confirmatory Factor Analysis

CFI, Comparative Fit Index

CIT, Comfort with Interpersonal Touch

CMIN, Chi-square Value

CNN, Convolutional Neural Network

CSS, Cascading Style Sheet

CSV, Comma-Separated Values

DB, Data Base

DF, Degrees of Freedom

DOM, Document Object Model

EFA, Exploratory Factor Analysis

ES, Expert Statement

FMRI, Functional Magnetic Resonance Imaging

GL, Guideline

GLOVE, Global Vectors for Word Representation

HIT, Human Intelligence Task

HTML, Hypertext Markup Language

HTMT, Heterotrait-Monotrait Ratio of Correlations

HTTP, Hypertext Transfer Protocol

IEEE, Institute of Electrical and Electronic Engineers

IOU, Intersection over Unit

IQ, Interview Question

IS, Information Systems

ISAT, Implicit Sensory Association Test

JPEG, Joint Photographic Experts Group

JSON, JavaScript Object Notation

JTAER, Journal of Theoretical and Applied Electronic Commerce Research

KMO, Kaiser-Meyer-Olkin

LDA, Latent Dirichlet Allocation

MFCC, Mel Frequency Cepstral Coefficients

MIME, Multipurpose Internet Mail Extensions

MSA, Measure of Sampling Adequacy

MSV, Maximum Shared Variance

NFT, Need for Touch

NLP, Natural Language Processing

NLTK, Natural Language Toolkit

OCE, Online Consumer Experience

ORQ, Overarching Research Question

OSD, Online Sensory Deprivation

OSMI, Online Sensory Marketing Index

OSMIW, Online Sensory Marketing Index, weighted

OSO, Online Sensory Overload

PCA, Principal Component Analysis

PDP, Product Detail Page

PCFI, Parsimony Comparative Fit Index

PNG, Portable Network Graphics

PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PX, Pixel(s)

RGB, Red, Green, and Blue

RQ, Research Question

RMSEA, Root Mean Square Error of Approximation

SEA, Search Engine Advertising

SEO, Search Engine Optimization

SD, Science Direct

SD, Standard Deviation

SLR, Scientific Literature Review

SPI, Sensory Perception Item Set

SQL, Structured Query Language

SSI, Semi Structured Interview

STFT, Short-Term Fourier Transformation

SUS, System Usability Scale

SWD, Selenium Web Driver

TF-IDF, Term Frequency Inverse Document Frequency

TLI, Tucker-Lewis Index

UEQ, User Experience Questionnaire

UMUX, Usability Metric for User Experience

URL, Uniform Resource Locator

UX, User Experience

VR, Virtual Reality

WORD2VEC, Word to Vector Embedding

WOS, Web of Science

WQI, Web Quality Index

YOLO, You Only Look Once

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I – INTRODUCTION

I - INTRODUCTION

Over the past decade, there has been a growing realization that the five human senses are pivotal in shaping consumers' purchasing decisions. This newfound understanding has led to the emergence of a powerful marketing strategy known as sensory marketing. Delving into the depths of scientific literature and backed by a multitude of studies, this approach has garnered significant attention and is rapidly gaining importance in both the scientific and the business landscape. As businesses strive to captivate and engage their target audience, understanding the profound impact of multisensory experiences has become crucial for staying ahead in today's competitive markets (Elder & Krishna, 2022; Peck & Childers, 2008). This is partly due to the increasing number of exchangeable products as well as a sensory overload of consumers. In addition, the increasing intensity of competition is making it more difficult for suppliers to attract the attention of consumers. In addition, consumer and buyer behavior has also changed dramatically in recent years because today, consumers rather strive for individualization and personalization in order to do justice to their own identity externally and to lend validity to it.

The specific sensory information of products and services can influence people's attitudes, purchasing intentions, and consumption (Petit et al., 2015) - be it the sound of opening and closing a car door, the smell and taste of a freshly brewed coffee, or the feel of the textile structure of a new dress. All these perceptible stimuli offer valuable information about the perceived quality of products and can have a significant influence on the purchasing decision process. After all, (advertising) messages always have a stronger effect if they affect the consumer through more than one sense (Krishna, 2012). As a result of changes in consumer and buyer behavior, sensory marketing has increasingly become part of the scientific discourse. It is dedicated to the interaction of several stimulus modalities and describes the systematic coordination - consequently not arbitrary, but well-considered - of all sensually perceptible marketing measures, especially in product and communication policy. The sensory researcher Aradhna Krishna defines (multi-) sensory marketing as *"marketing that engages the consumers' senses*

and affects their perception, judgment, and behavior." (2012, p. 332). This definition is based, in the first instance, on the findings of neuromarketing because man experiences the world around him with all his senses. In the brain, the impressions about seeing, hearing, feeling, tasting, and smelling are decoded. Only as a result can people react to the environment. The advantages of a sensory consumer approach are obvious: an increase in attention for the product and/or the brand, a resulting higher memorability value, and ultimately faster recognition, combined with the possibility of differentiation from the relevant competition (Krishna, 2012). But what strategy should be chosen if products are to be marketed via the Internet on electronic commerce (e-commerce) websites? - The basic problem of marketing goods on the Internet is that some human stimuli cannot be addressed or only to a very limited extent. This limitation applies especially to haptics when consumers are unable to feel the quality of clothing, for example, as they are used to in terms of weight or material properties (Klatzky et al., 1993).

Nevertheless, current statistics confirm that the e-commerce channel is still on a continuing growth course, particularly in the US, Asia, and Northern Europe (Pappas et al., 2017; Statista, 2023a). Furthermore, forecasts for the coming financial years till 2027 point to even more significant growth of up to $5,557.5 billion by 2027, which will be a double-digit compound annual growth rate of roughly 14.4 % driven by more than 1/4 of the world's population already shopping online (Adam et al., 2020; Chevalier Stephanie, 2021; Statista, 2023b).

1.1. MOTIVATION

Sensory Marketing is currently at a tipping point because the challenge lies in transferring the sensory address to the digital world. This leads to a complex environment in which e-commerce business constantly demands new concepts of communication and style to resist the future. In order to enable such a tremendous change, it is required to design a new understanding of sensory marketing in terms of digitization. The literature offers different ways to acknowledge those changes and adapt some hints towards them. Nevertheless, acknowledging the research of sensory marketing of the last two decades leads to the assumption that in a changing world, an overarching viewpoint needs to be taken. However, current research does not take a holistic view of how an e-commerce website should look from a sensory marketing perspective. So, it can be stated for now:

The main issue is that no current sensory marketing model incorporates existing digitization trends and sensory aspects of communication. In fact, no model gives generic guidance on how to design an e-commerce website appropriately regarding sensory marketing and allows an evaluation of the sensory communication quality.

From this, it can be concluded that research is still in its infancy, and a deeper analysis must be carried out within this space. Therefore, this dissertation will pick up on the need described above and create an automated assessment framework named the Online Sensory Marketing Index (OSMI). The following paragraph highlights the scientific objectives of the research scope and related research questions.

This study's intended practical and immediate contribution is to provide scoring templates against which future studies could gauge the nature and direction of sensory elements in e-commerce websites. Otherwise, the extensive gathering of sensory data requires enormous effort to provide a reasonable standard for managers responsible for coordinating the development of related marketing statements.

This initial attempt at empirical research in sensory marketing provides encouraging evidence of the accuracy of previous conceptual writings and case

studies. A measurement model will be created to identify and evaluate online sensory consumer engagement quickly and conveniently. The proposed online sensory marketing index (OSMI) provides a new perspective for communicating sensory effectiveness in online environments. Therefore, this research represents the first marketing study to explore a utilizable model for analyzing how e-commerce websites could be designed to achieve a better sensory consumer approach. The OSMI aims to create a holistic overview of the strengths and weaknesses of examined websites, including advice for optimization in sensory communication.

Furthermore, the OSMI framework will be illustrated by many research findings related to e-commerce websites from various industries to confirm the validity and potential of the score. Additionally, it will be further elaborated on a comprehensive approach to automate OSMI assessments by applying artificial intelligence (AI) technologies. Thus, the sensory score could be determined more quickly in the future and impact the daily work of practitioners in the marketing environment. Finally, the results of this work will be intended to provide marketing managers with clear strategic guidance on developing appealing sensory websites and fostering online sensory consumer experiences. In addition, advice for additional academic research will be carried out.

1.2. SENSORY MARKETING

When he opened his Oxford Street department store in London in 1909, American-born businessman Harry Gordon Selfridges knew that entrepreneurial success highly depended on a consistently coherent customer's (sensory) shopping experience (Mosley, 2007). Most customers were overwhelmed by the sight of the bright, sumptuous space. Items were put on tables, maybe touched, and compared. Perfumes in the entrance area provided a pleasant scent as a contrast to the stench on the London streets (Selfridge, 1918). Selfridges had discovered multisensory marketing for his store. One hundred years later, the sensory consumer shopping experience is equally important but faces drastic adjustments in rising Internet sales. People are increasingly buying and consuming online (W. Liu et al., 2017), and the Covid19-crisis in 2020/21 has further increased the competitive pressure (Hilken et al., 2022; OECD, 2020; Roggeveen & Sethuraman, 2020).

According to Petit et al. (2015, 2019), customers can identify product features based on their prior product experiences if simple digital interfaces like a screen, mouse, and headphones are available. Additionally, new technologies are likely to become usual in the near future due to increasing technological efforts in virtual reality (VR) and augmented reality (AR), which can be subsumed under the broad research agenda named sensory enabling technologies (SETs) (Velasco et al., 2021).

1.3. THEORETICAL FOUNDATIONS OF SENSORY MARKETING

Instead, these sensory systems operate simultaneously. They can be differentiated into a language-based processing system and a non-linguistic processing system (Childers & Jiang, 2008). The former involves the processing of linguistic and numerical information, while the latter is dedicated to processing visual, olfactory, haptic, and auditory stimuli. Although it is believed that the non-linguistic processing system functions somewhat autonomously, there is a close interconnection between the two processing systems (Esch, 2014). Consumers mentally associate cohesive sensory impressions that correspond to a pattern of meaning, thereby constructing a comprehensive representation of the environment. Following this understanding of sensory processing and the theoretical patterns of sensory marketing, this section highlights the importance of multisensory enhancement, sensory imagination, sensory overload, and sensory deprivation as underlying foundations of sensory marketing.

1.3.1. Multisensory Enhancement

An essential foundation for the subsequent sensory understanding is that the human brain operates associatively (Barsalou, 2008; Barsalou et al., 2003). The human brain stores both sensory signals and tactile information (movements) and connects them together. According to Allan Paivio´s dual coding theory (1991), information stored mentally in multiple codes is advantageous in terms of memory performance. This is an important finding for marketing science and practice in general and sensory marketing in particular because the more associations that are learned with the same information, the more diverse the consumer appeal

becomes. It should be noted that such multimodal representations can be activated by any of the participating modalities (Krishna & Schwarz, 2014).

From a perceptual psychology perspective, it is well-established that an item´s objectively identical characteristic can be influenced by one or more concurrently occurring altered features. For example, packaging or music can influence the perception of the actual product. Similarly, the evaluation of the quality of the same product often differs when it is presented as a branded product versus a no-name product. These are psychological effects that arise from the presence of multisensory stimuli and are often referred to as crossmodal correspondences (Pinardi et al., 2023). There are several studies in place that conducted research about sensory crossmodal dependencies, for instance, regarding ambient scent and store environment (C. Adams & Doucé, 2017; Spence et al., 2014), concerning colors and taste (Spence et al., 2015; Spence & Levitan, 2021; Woods et al., 2016), between visual textures and temperature (Barbosa Escobar et al., 2022) and almost all other crossmodal sensory combinations have been already demonstrated (Spence, 2011). Understanding this interplay and its effects can, therefore, be utilized in marketing, specifically focused on online marketing for e-commerce websites, and will be further explored in the following.

Humans are not rational actors, and they can be easily manipulated in their perception. This offers potential in the design of a point of sale, including the online context of e-commerce websites.

Sensory marketing involves understanding the interplay between different senses and their impact on consumer perceptions. Krishna (2012) emphasized the importance of considering positive interactions between senses within this context. This article aims to summarize the findings of various studies conducted on sensory marketing, highlighting the influence of congruent scents, semantic associations, sensory properties, and the dominance of certain senses.

In the context of sensory marketing, it is important to consider the positive interaction between senses, as highlighted by Krishna et al. (2012). For example, the haptic evaluation of product scents can be influenced, particularly when the scents are congruent. Therefore, careful attention should be given to semantic associations and sensory properties when selecting accompanying scents. Krishna et al. (2010)

conducted a study demonstrating that the presence of a congruent scent leads to more positive haptic perceptions regarding the texture of paper.

Furthermore, Spangenberg et al. (2005) demonstrated that selected music in retail settings, such as Christmas music, combined with a congruent scent (e.g., Christmas fragrance), leads to better evaluations. Multisensory advertising that appeals to multiple senses rather than a single sense (e.g., taste) has been found to be more successful. This indicates the significance of incorporating various sensory stimuli to enhance consumers' overall experience and perception of a product.

In addition to scents and music, Yorkston and Menon (2004) found that sound symbolism influences perceived taste. Participants in their study attributed the characteristics of perceived sounds (e.g., lightness) to ice cream. This suggests a cross-modal effect between auditory and gustatory senses.

Krishna and Morrin (2008) demonstrated that non-diagnostic stimuli, such as product packaging, can influence product evaluations through other sensory channels. Their study revealed that taste is perceived more positively when the container's texture is firmer. This highlights the importance of considering non-diagnostic sensory cues when designing product packaging.

The dominance of certain senses becomes evident when they occur in combination. Lindstrom (2005) demonstrated the dominance of the visual sense in an experiment where participants were given a drink with lemon and lime flavors at different intensity levels. Participants were asked to indicate which drink was the sweetest or sourest. They erroneously assumed that as the color intensity increased, the acidity level would also increase, thus proving the effect of color manipulation.

Furthermore, research has shown that the visual sense can exert dominance over both the auditory and haptic senses, highlighting the intricate nature of sensory interactions (Hecht & Reiner, 2009). It has also been confirmed that neither the haptic nor the auditory senses hold superiority over each other, irrespective of the direction of influence. These findings underscore the importance of considering the dominance of specific senses when formulating effective marketing strategies.

In conclusion, when implementing systematic, multisensory marketing, it is important to consider the potential influence and amplification of senses on each other. This applies to both diagnostic and non-diagnostic stimuli. However, it is

essential to be aware of the possible dominance of a sense, which often stems from the visual sense (Krishna, 2012). Understanding these dynamics can empower marketers to create more impactful and successful sensory marketing strategies. By carefully selecting and combining sensory elements, businesses can enhance consumer experiences and shape their perceptions of products and services.

1.3.2. Need for Touch in Marketing

Not every individual possesses the same level of affinity or need for touch (NFT). To measure the need for touch, researchers Peck and Childers (2003a) developed a scale. This scale comprises two dimensions: the functional and emotional dimensions, each comprising six questions. By assessing differences in the need for touch, the NFT allows for recognizing variations in evaluations (Krishna & Morrin, 2008; Peck & Wiggins, 2006). It is important to note that the two dimensions of the NFT are also referred to as instrumental and autotelic NFT. The instrumental NFT refers to the conscious use of haptic information and is functionally oriented. If a consumer has a high instrumental NFT value, the haptic attributes of a product become highly relevant and significantly influence the purchasing decision-making process. For humans with a high instrumental NFT, prior touching of products such as fruits can be internally binding, minimizing purchase risk and enabling the formation of a self-derived (quality) judgment based on personally elicited haptic information. Resultingly, in this case, touching serves as a tool for product evaluation, driven by motivation, directed towards a goal, and characterized by rational and functional aspects (Peck & Childers, 2003b).

The impulsive and spontaneous touching of products, on the other hand, is described by the autotelic NFT and is motivated by the pleasure and happiness the product's haptic features provide. For these people, touching primarily aims to elicit a pleasurable sensation rather than the gathering of information. Even when haptic information is unrelated to the purchase choice, the autotelic NFT can contribute to spontaneous, impulsive purchases if the act of touching is seen as pleasurable (Nuszbaum et al., 2010). The autotelic NFT, however, does not influence consumers' overall intent to buy. It is noteworthy that instrumental and autotelic NFT show a positive correlation, indicating a relationship between instrumental and pleasure-oriented (autotelic) touch (Peck & Childers, 2003a).

Further support for the role of tactile sense in product evaluation and purchase decision-making was found in a study by Peck and Childers (2003b). In this study, 199 participants were asked to evaluate a sweater and a mobile phone. Half of the participants had the opportunity to touch the products, while the other half could only see them through plexiglass and were unable to physically touch them. It was observed that participants with high NFT levels were overall more confident and less frustrated with their product evaluations when they could physically touch the product. However, for participants with low NFT, whether they touched the product or not made no difference. Written descriptions of how the product felt during use partially helped alleviate the frustration experienced by individuals with high NFT. This effect was particularly evident for the tangible haptic quality of the phone's weight but not for the less concrete quality of sweater softness. Therefore, when a consumer with a high NFT value can only see a product but not touch it, this leads to poorer product evaluation and a generally uncertain judgment, especially when evaluating clothing that is typically best assessed through tactile means. Based on these findings, it is important for products to evoke a sense of haptic pleasure. The NFT is also closely related to involvement, but this relationship only applies to individuals with low NFT. Additionally, Citrin et al. (2003) found evidence of gender-specific differences in the need for touch. According to their research, females have a stronger need for touch compared to males, although the exact reasons for this have not been precisely determined. The same authors also discovered a negative association between NFT and the preference for the internet as a shopping environment. Interestingly, attitudes, product evaluations, and purchase intentions are significantly influenced by tactile rather than visual information, especially for products based on haptic attributes.

In another study, Morhenn et al. (2008) found that touch alone does not increase oxytocin levels but contributes to oxytocin release when accompanied by an act of trust. From an evolutionary perspective, this conclusion makes logical sense, as touch followed by trust leads to greater generosity. The combination of touch and trust implies a sense of community or a family situation where generosity is expected. This finding is particularly relevant in point-of-sale situations, raising the question of whether and how it can be applied in the e-commerce domain. However, interpersonal touch has strict boundaries. In most cultures, touching hands, arms, and even shoulders is considered acceptable, while

all other areas are generally considered off-limits. Generally, mentally empathizing with touching objects like products can automatically be perceived as pleasant or unpleasant, resulting in divergent emotions (Rizzolatti et al., 1996).

Furthermore, each individual possesses a unique affinity for touch. The comfort experienced in interpersonal touch varies among individuals. The "Comfort with Interpersonal Touch" (CIT) index, developed by Webb and Peck, aims to measure an individual's preference for touch. Individuals with a high CIT prefer touch-intensive products or services, whereas those with a low CIT lack a pronounced affinity for touch and consequently avoid the point of sale, particularly in highly crowded environments. The generosity-inducing "Midas effect" that interpersonal touch can trigger is absent in these individuals. However, interpersonal touch can generally evoke sympathy, which can be advantageous in consumer engagement (Heslin & Alper, 1983).

In conclusion, despite the various possibilities in marketing activities, haptics entails a more costly function compared to visual perception, as physically reaching and touching an object requires more physical energy than visually examining it (Jones & O'Neil, 1985). However, haptically perceived signals are typically significant and challenging to manipulate. Consequently, haptics is of significant importance in the context of online shopping, particularly in the e-commerce business (Brasel & Gips, 2015). Even though consumers cannot directly touch products in virtual environments, they can imagine touching it (Inoue, 2023).

1.3.3. Sensory Imagination

Sensory experiences are often only indirectly possible. Shopping through catalogs or e-commerce websites particularly limits haptic, olfactory, and gustatory sensory stimuli. However, it should be noted that all mental processes involve sensory simulation (Barsalou, 1999). This implies that through mental associations, these senses can be indirectly addressed using the available senses, a concept also referred to as "sensory imagery." Thus, visual and auditory elements, particularly, can serve as carriers for the other three senses (Barsalou, 2008; Chen et al., 2016; Petit et al., 2016). It has been established that the visual and haptic senses are strongly interconnected. For example, observing a product can elicit the same neural activities as actual touch or usage, demonstrating that touch and interaction

with a product can be mentally simulated (Chao & Martin, 2000). This is because images can engage the motor and tactile senses of consumers. This principle should also apply to e-commerce websites, where actual touch or tasting may not be possible, but under the assumption of mental simulation, it can be imagined. Studies by Elder and Krishna (2012) indicate that humans mentally simulate the movements that can be performed with a visually presented product. Therefore, both offline and online product presentations should aim to appear as realistic and tangible as possible. Specifically, applying a first-person perspective in product representation is preferable to facilitate the viewer's imagination of product usage, ultimately leading to increased consumer willingness to purchase (Elder & Krishna, 2012; Raposo et al., 2009). The arrangement or positioning of products in advertising communication is of high relevance. Various studies have shown that the depiction of products, such as a cup, should always be as tangible as possible to generate a high purchase potential and willingness to pay (Elder & Krishna, 2012; Krishna, 2012). Specifically, a cup with its handle should be oriented towards the dominant hand (usually the right hand) to subconsciously and mentally simulate grasping the object. This activates the motor cortex, the responsible area in the human brain for motor processes, even though the object is not directly graspable (Jeannerod, 1994). The goal is to design visual communication in a way that makes the viewer feel as if they are holding the product themselves.

Peck, Barger, and Webb (2013) further explored whether mental touch or the mere imagination of touching a product can generate and enhance the sense of ownership. The findings of this study indicate that the strongest sense of ownership occurred when a product was both visually inspected and physically touched. However, the mental simulation of touching a product can lead to an equally strong sense of ownership. This effect is limited by the particularity that this observation only took place when participants closed their eyes during the simulation. Nevertheless, the result generally shows that the more realistically viewers can imagine holding a product in their hands, the more significant the endowment effect becomes, increasing the attractiveness of the advertised product and the consumer's willingness to pay (Labroo & Nielsen, 2010). Krishna and Morrin (2008) also demonstrated that written haptic information in the form of texts can influence consumer perception without actual touch being necessary. Similarly, visually imagining hand movements facilitates the haptic representation of material

properties such as texture (Klatzky et al., 1993). Multiple neuroscientific studies point to such mental simulation, where the conceptual processing of sensory perceptions leads to the neural activation of corresponding brain regions. For example, imagining Beethoven activates the auditory cortex (Zatorre & Halpern, 2005). Reading strong odors such as "cinnamon" or "garlic" activates the primary olfactory cortex (González et al., 2006), and visually perceiving images of chocolate cookies activates the gustatory cortex and auditory sense (Simmons et al., 2005).

Table 1. Selected Overview of Sensory Imagination Research

Imagination of Sense	***Research Activities***
Haptic Imagination	• *(Krishna & Morrin, 2008)* • *(Peck et al., 2013)* • *(Klatzky et al., 1991)*
Olfactory Imagination	• *(Krishna et al., 2014)*
Acoustic Imagination	• *(Rao Unnava et al., 1996)*
Gustatory Imagination	• *(Compeau et al., 1998)* • *(Tiggemann & Kemps, 2005)* • *(Morewedge et al., 2010)* • *(Larson et al., 2014)*
Visual Imagination	• *(Elder & Krishna, 2010)* • *(Andrade et al., 2014)*

All the listed studies in Table 1 address the influences of sensory processing and demonstrate that imagination can serve as a means of compensating for actual sensory stimuli (Labrecque, 2020). This understanding is particularly important for the subsequent examination of communication strategies employed by e-commerce websites, as they must utilize these insights as a foundation for effectively communicating with online consumers.

1.3.4. Sensory Overload

In his article entitled *"The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information,"* George A. Miller (1956) hypothesized that the capacity of human working memory is limited. Miller argues that humans can retain only about seven (plus or minus two) pieces of information at a time in short-term memory. These pieces of information can be, for example, numbers, words, or other units. Even though this has made it clear for decades that human working memory is limited, Miller´s 7±2 is to be understood as a rough estimate, and more recent studies already indicate that the number is even only about three or less (Doumont, 2002; LeCompte, 1999).

Given the intricate nature of sensory processing as it pertains to the sensory communication quality of e-commerce websites, adopting a *"more-is-better approach"* (Bleier et al., 2019, p. 111) may not necessarily be the optimal choice. Overemphasizing sensory appeal to consumers can have a negative impact on their purchase decisions (Homburg et al., 2012, 2013). As Riedel and Mulcahy (2019) suggest, it is important to question whether overwhelming consumers with sensory stimuli truly makes sense. In the scope of sensory marketing, it is crucial to recognize that addressing all five senses in a targeted manner does not necessarily translate to addressing all senses comprehensively. It may suffice to address two to three senses strategically. A study conducted by Homburg, Imschloß, and Kühnl (2012) explored the concept of sensory overload by exposing participants to various sensory stimuli and levels of excitation. They found that combinations of stimuli with congruent levels of excitation contribute to a greater willingness to pay and more favorable evaluations of products. This highlights the significance of achieving sensory congruence in responding to consumers. Additionally, the study indicates that when three sensory stimuli are employed in a retail environment, one stimulus should have a lower excitation level. If three highly stimulating sensory stimuli are utilized, it may diminish consumers' willingness to purchase a product and result in less positive evaluations, hence causing a detrimental impact on consumer experiences, as confirmed by previous research (Malhotra, 1984; Petit et al., 2019). In addition to the number of stimuli and their arousal quality, the onset of sensory overload may also depend on the neurological processing of sensory stimuli. Accordingly, lower senses are

considered as those that are processed less attentively, are more complex to identify, and are more emotional, such as taste, smell, and touch. On the other hand, considered higher senses are vision and audition (Boswijk et al., 2007; Köster, 2003, 2009). Building on this, Doucé et al. (2020) discovered that it is more likely for a third congruently addressed higher sense to lead to a sensory overload.

In digital sensory marketing, it is reasonable to assume that sensory overload can lead to an aversion towards the visited website, even though there is little specific research on overload scenarios with a focus on digital channels. However, as Krishna (2012) points out, achieving a sensory overload works in the same way as causing an information overload, although scientific research is still needed to fully understand this phenomenon.

1.3.5. Sensory Deprivation

Numerous scientific studies underpin that limited or no sensory communication on e-commerce websites can have a negative impact on the online sensory consumer experience (see 5.1.1 for an overview). This phenomenon can be defined as online sensory deprivation (OSD), and its description is based on Solomon et al. (1957). Following that, OSD occurs when consumers experience a significant lack of sensory stimuli perception in the online environment, leading to a disorienting and frustrating digital consumer journey. The absence of external stimuli, such as colors, sounds, people, and conversations, can contribute to cognitive disorders and a sense of discomfort. In severe cases, this deprivation occurs when essential sensory stimuli, such as gustatory texts and images on food websites, are absent. Moreover, the absence of these sensory modalities in online environments can result in consumer boredom and reduced time spent on the viewed website. The early stages of the internet reflect that text-heavy pages quickly discouraged users from further browsing and made browsing less enjoyable. Furthermore, the NFT serves as a mediating factor that emphasizes the importance of conveying haptic sensory impressions on the internet (Gatter et al., 2022). Additionally, research by Yazdanparast and Spears (2013) suggests that high NFT can be compensated for the frustration caused by the lack of haptic stimuli by maintaining a positive mood. Their findings provide insights on how to overcome OSD in such cases.

1.4. ARTIFICIAL INTELLIGENCE IN MARKETING

Artificial Intelligence (AI) is not a new research stream. The term AI has been accepted since 1956 *"As the official label for a new discipline,"* as Ekbia (2010, p. 210) underlines. Despite this long history, AI has recently become one of the most increasingly important marketing science and practice-related topics due to highly improving computing capacity and techniques capable of handling vast amounts of data (Mariani et al., 2022). In particular, marketing as the way firms engage with customers is being disrupted by the implementation of AI-assisted consumer services (e.g., chatbots) and other criteria that fundamentally change and enhance the consumer journey (Davenport et al., 2020; Rust, 2020). The Marketing Science Institute (2022) concurs with this notion and has recently classified the research priority between marketing and AI as a macro trend, designating it as the topmost research priority. In this context, Huang and Rust (2021, p. 31) define AI as:

"The use of computational machinery to emulate capabilities inherent in humans, such as doing physical or mechanical tasks, thinking, and feeling."

In addition to this definitional description of AI, numerous other versions of AI definitions exist in academia, each summarizing aspects of computer intelligence programmed to perform human-related tasks (Dwivedi et al., 2021), but will not be further diversified below for further consideration. This decision is based on the comprehensive perspective espoused by Huang and Rust's definition. Following the above version, AI can be divided into three application areas:

- *Mechanical AI* focuses primarily on service-related topics with regard to marketing. AI clustering, classification, translation algorithms, and programs subsumed here are conceptualized at automating various repetitive routine and data-intensive functions, for instance, in relation to advertising (M.-H. Huang & Rust, 2018).
- *Thinking AI* represents another delimitable ambit. As Huang and Rust´s (2021) declaration already suggests, the objective of AI, which is located here, is computer-intelligence-controlled tasks that aim to gain new insights from data processing on the one hand and to arrive at new decisions on the other. Thinking AI is currently rapidly

advancing, even if it can be counted as the higher form of machine thinking, as it follows less logical thinking patterns and, in contrast, includes intuition (M. H. Huang et al., 2019). The goal of thinking-AI-based applications is to analyze typically unstructured, large data sets for regularities and patterns, for example, to recognize faces, texts, or speeches. Furthermore, thinking AI includes methods such as neural networks and deep learning for text and image processing.

- *Feeling AI* forms the third and final aspect of differentiation, according to Huang and Rust (2021). This artificial intelligence category predominantly relates to analyzing human emotions and feelings. The underlying methods are often based on sentiment analyses in general across different data types (M. H. Huang & Rust, 2021). Additionally, natural language processing and recurrent neural networks are used for this purpose. In marketing applications, Feeling AI is implemented, in particular in personalized real-time operating recommendation agents (Davenport et al., 2020).

However, the three purpose-oriented delineations of AI are by no means mutually exclusive, as noted by Huang and Rust (2021) themselves. They are, rather, fuzzy definitions (Varki et al., 2000) deliberately designed to allow for overlaps in methodological categorizations. For instance, the text-based topic modeling method Latent Dirichlet Allocation (LDA), which is important for the systematic literature review in this dissertation (see section 4.3), can be attributed to both Thinking AI and Feeling AI. LDA belongs to both because it is applied in marketing as well to detect and group customer satisfaction based on user-generated content, such as reviews (Tirunillai & Tellis, 2014).

As Huang and Rust (2021) point out, the current academic marketing research does not offer sufficient guidance on how to effectively leverage the benefits of AI to maximize marketing impact. Dwivedi et al. (2021) also identify several social, economic, organizational, and data-related challenges associated with the implementation of AI in general and in marketing-related activities and decision-making. In particular, with regard to the scope of this dissertation, it should be noted that AI is not yet being utilized for sensory website evaluation and

design. For this reason, among other things, this dissertation aims to contribute to using AI methods to expand the analytical horizon and the possibilities for effectively discovering, evaluating, and, if necessary, adapting online sensory components in e-commerce web shops.

1.5. DISSERTATION STRUCTURE

The underlying dissertation structure is illustrated in Figure 1 on page 48 with each subsequent section of this research. In chapter I, the motivation and theoretical foundation have been presented. This initial chapter aims to establish a fundamental comprehension of sensory marketing and the underlying principles of multisensory enhancement, the influence of the need for touch, sensory imagination, and the effects of sensory overload and deprivation.

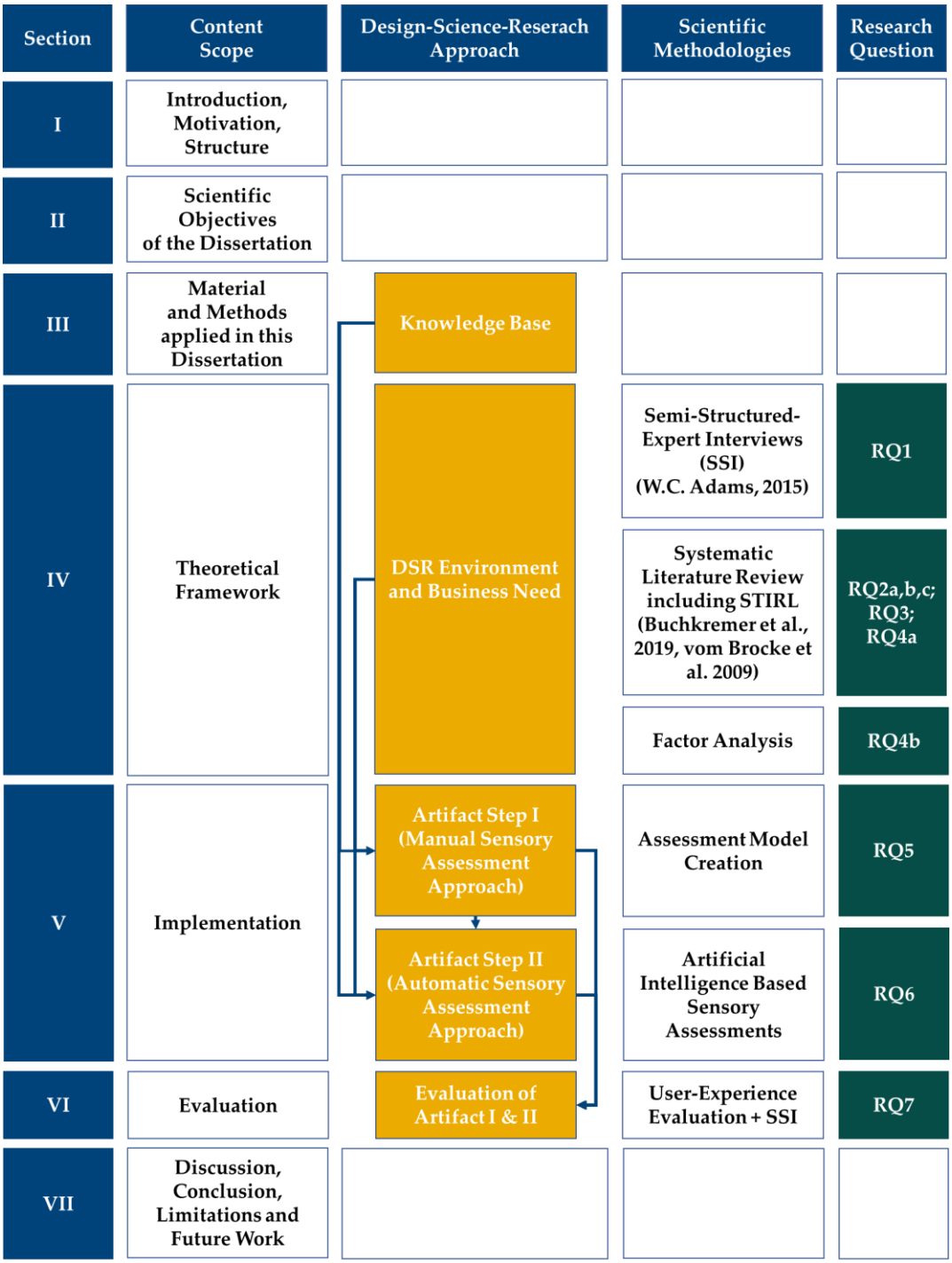
Chapter II provides a comprehensive account of the research methodology to be employed. It specifically elucidates the research objectives and its research questions (RQs). Here, the seven RQs of this work are directly placed in the framework of Design Science Research (DSR), according to Hevner et al. (2004).

Next, chapter III presents the materials and methods applied to answer the RQs, including precise directions for the work based on the DSR guidelines.

After that, chapter IV highlights the theoretical framework. This section is divided into four distinct parts. The first part entails the requisite definitions and foundational elements essential to this dissertation. The second part delineates the scope of this study through semi-structured interviews. In the third part, the research gap of this thesis is presented, grounded in the identified scope from chapter II. In light of the definitions and the identified research gap, the fourth part systematically presents pertinent literature related to this thesis by means of a systematic literature review. Subsequently, chapter V illustrates the development process of the artifact, encompassing the creation of a manual assessment approach (Artifact I) and a mock-up/prototype (Artifact II). Chapter VI critically examines the developed artifacts via semi-structured expert interviews (related to Artifact II) and user experience questionnaire evaluations done by online marketing experts.

Finally, sections VI and VII discuss and conclude this research endeavor, highlighting its limitations and outlining avenues for future research.

Figure 1. Dissertation Structure



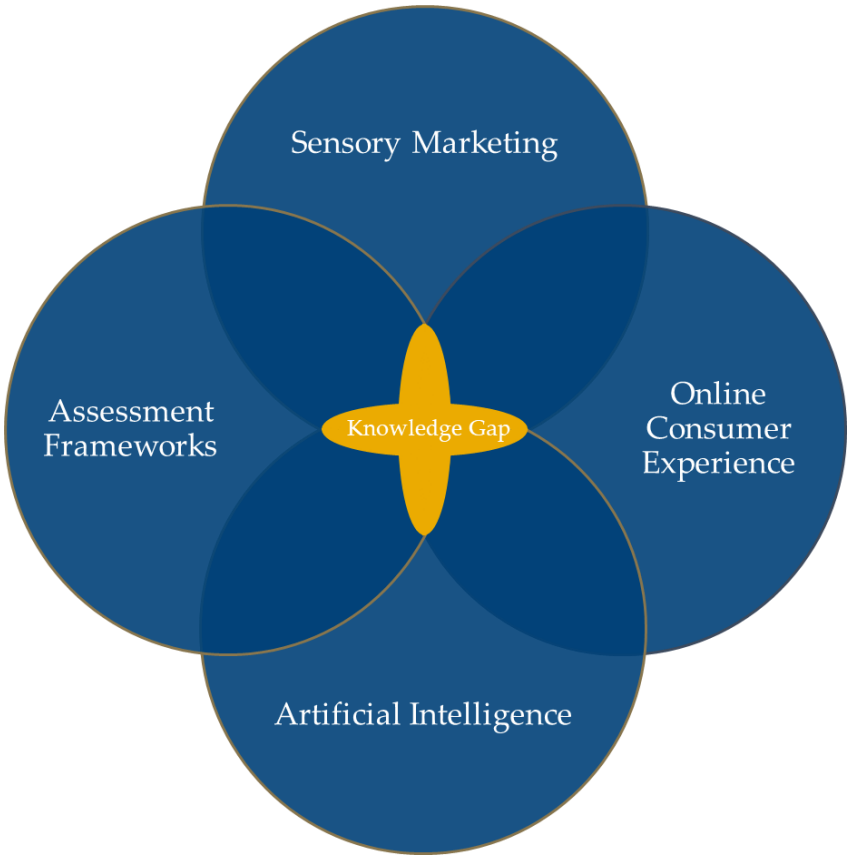
II – OBJECTIVES

II - OBJECTIVES

2.1. EXPLORING THE RESEARCH GAP

The theoretical foundations described in section 1.3, namely multisensory enhancement, need for touch, sensory imagination, sensory overload, and sensory deprivation, form the scientific basis for the following objectives of this work. In addition, they contribute to the knowledge gap that this dissertation intends to close with the research questions (RQs) defined in the next section, 2.2. As already mentioned in section I, Figure 2 below highlights the research gap between the four scientific areas of sensory marketing, online consumer experience, and assessment frameworks, generally and in combination with artificial intelligence methods.

Figure 2. Illustrated Knowledge Gap



The four dimensions are defined before elaborating on the knowledge gap in more detail. As visualized above, the concrete knowledge gap is surrounded by four different dimensions, and all of them have interactions with each other.

Firstly, Sensory marketing forms the overall frame of the dissertation. It is the key to understanding how to communicate to consumers appropriately. This can happen, e.g., in terms of haptics as strongly as if the viewer acts, such as clapping his hands, at the moment of reading. However, the words used must be placed in concrete, factual context (Raposo et al., 2009). In this context, the use of active verbs instead of nouns is advantageous for the aforementioned reasons (Bower, 2004). According to McCabe and Nowlis (2003), product descriptions and advertising messages are perceived more strongly if they contain a pictorial description of the sensory experience. Their findings suggest that companies must go beyond enumerating product attributes by describing haptic properties in detail.

Apart from this, research suggests an ongoing development towards the digitization of the senses - see also Spence et al. (2017) for an overview. The transfer of knowledge from the field of sensory marketing can often be abstracted to the digital space. Hence, e-commerce consumer experience, as a special field of online consumer experience (OCE), has enormous potential to be enriched with sensory communication aspects. For instance, research from sensory marketing in offline environments indicates that texts and images can enhance the OCE if they are written or designed to match the five human senses (Elder & Krishna, 2012). Additionally, several other criteria are crucial for a pleasant OCE, namely, an appealing design of the online shop, 3D product visualizations, and virtual and augmented reality, among others. By incorporating these elements, even consumers with high NFT can be brought to online shopping (Roggeveen et al., 2015; San-martín et al., 2017; Yazdanparast & Spears, 2013). For this and other reasons, the intersection of these two dimensions is large.

Assessment frameworks for the two dimensions only exist to a very limited extent. There are already some key performance indicators in the area of online consumer experience, such as bounce rate and click rate, but there is a lack of qualitative metrics, especially in terms of online sensory communication quality. Consequently, in the area of sensory marketing, an overall assessment framework for offline and online communication elements is missing but very important due

to the findings described in sections 1.3 and 1.4. Going along with this argument, artificial intelligence is the key to getting a clear understanding of the existing knowledge gap. According to the visualization in Figure 2, all dimensions do have some interactions with AI. For the time being, it is obvious that sensory marketing, in particular, does not have extensive contact with AI. Therefore, the overall goal is to connect these four dimensions more closely and thus close this knowledge gap by addressing the subsequently presented research questions (RQs).

2.2. DEFINING THE RESEARCH AGENDA

As previously revealed, the e-commerce business is a steadily growing business field, but it is limited at the same time to only two senses in terms of the online consumer experience – namely, the visual and acoustic sense. Therefore, sensory marketing, particularly in *"light of new technologies"* (Petit et al., 2015, p. 1), gains rising scientific and practical relevance (Doucé et al., 2022). Consequently, the focus of this dissertation centers around an overarching research question (ORQ) along with seven derived research questions (RQ1-RQ7) to investigate the ORQ in detail. Figure 1 provides an overview of the dissertation's content, outlining the methodology employed to address each research question and the corresponding chapters where the results are presented.

2.2.1. Overarching Research Question

The overarching research question leading the dissertation´s direction and all of its subsequent steps are defined as follows:

ORQ: *Does a need for sensory marketing efforts in online environments exist, and to what extent can automated assessments based on AI help increase efficiency in online marketing department´s daily work?*

A guiding principle needs to be set up to obtain the ORQ and the various included criteria. Therefore, this dissertation will be aligned with an overarching framework that allows for a strategic and systematic procedure in each working step. Since the dissertation´s research scope is closely related to design science in

information systems, the DSR guidelines proposed by Hevner et al. (2004) will be situated as the grounding foundation to answer the ORQ because it provides an established obligatory scientific design development thread. The guidelines are dedicated to the design of various artifacts in the context of information systems, ranging from concepts, software architectures, models, or methods to applications. The DSR consists of four essential elements in the research process, namely the environment in which the problem or the need occurs, the knowledge base (e.g., existing scientific literature), the to-be-designed artifact (the solution), and its evaluation (see section 3.1 for detailed description).

Next, to answer the formulated ORQ, the necessary research questions will be presented along the four DSR elements.

2.2.2. DSR Environmental Research Question (RQ1)

As stated by Hevner et al. (2004), a crucial aspect in formulating a solution approach is understanding the context in which the problem is situated. This encompasses identifying the individuals, organizations, and technologies affected by the problem at hand. Based on this premise, the present dissertation establishes the subsequent DSR environmental research question that inquires:

RQ1: Do experts confirm a need for sensory evaluation in online environments?

To answer RQ1, first, the DSR environment will be defined. Following this, experts in the field of e-commerce need to be recruited. To answer the RQ by the experts, semi-structured interviews based on W.C. Adams′ (2015) interview guidelines will be applied.

2.2.3. DSR Knowledge Base Research Questions (RQ2-4)

Building on the identified problem environment in DSR research, the next element to be investigated is the knowledge base. According to Hevner et al. (2004, p. 80), *"The knowledge base provides the raw materials from and through which IS [information systems, ed. by author] research is accomplished."* Hence, it serves as a final

preparation before developing an artifact. The knowledge base generally reflects the current state of research in the particular field of interest of the work – this dissertation, to be precise - is put in. In conclusion, the relevant knowledge base to an identified problem environment can consist of theories, frameworks, related work, methods, and techniques, among others.

Therefore, the second research question (RQ2) is designed to facilitate the systematic construction of this knowledge base. Following the introductory foundation of this dissertation, RQ2 is trilaterally defined as follows:

RQ2a: What relevant sensory marketing-related theories, findings, or assessment concepts exist to improve the online sensory consumer experience?

RQ2b: What relevant approaches exist in the scientific literature that combine sensory marketing and artificial intelligence, and what are their purposes?

RQ2c: What relevant approaches exist in the scientific literature that combine sensory marketing, artificial intelligence, and automation efforts to finally provide an automatic assessment framework for sensory marketing e-commerce content?

RQ2 is intended to explore possible research gaps in the three sub-areas of the dissertation. Thus, these three research sub-questions will be investigated by gathering, screening, and evaluating the relevant scientific literature via the utilization of a systematic literature review (SLR) as suggested by vom Brocke et al. (2009). To get a holistic overview of the scientific literature landscape, the artificial intelligence-based literature review proposal of Buchkremer et al. (2019) is to be combined in this stage.

Based on this SLR, the third research question builds on RQ2 and aims to investigate the subsequent literature synthesis:

RQ3: To what extent is the dissertation´s scope integrable to existing sensory marketing-related literature aiming at enhancing the online sensory consumer experience?

Consequently, RQ3 aims to identify and explain existing sensory marketing-related scientific contributions to online sensory consumer experience with potential assessment approaches and how this dissertation can contribute to them.

In order to establish a comprehensive knowledge base, further investigation is conducted to determine if there are supplementary specific aspects related to sensory e-commerce marketing in addition to the sources identified in RQ2. This is accomplished by seeking input from experts who have already been presented with RQ1 and asking them to answer the following question:

RQ4a: To what degree do sensory elements impact e-commerce from a B2B and B2C perspective, and what factors can be identified as drivers of this influence?

With the results derived from RQ2 and RQ4a, RQ4b intends to assess if the sensory marketing criteria derived from scientific literature and experts in the field will be confirmed as essential by consumers. Hence, RQ4b asks:

RQ4b: Which sensory online elements are considered important from a consumer perspective, and to what extent?

This sub-question will be addressed by administering two online surveys targeting consumers, followed by statistical analyses to determine the level of importance attributed to sensory elements within the online-based consumer journey. The resulting findings from RQ3 and RQ4 will serve as the basis for developing an artifact - an assessment approach specifically designed to evaluate sensory marketing elements in the e-commerce domain.

Thus, the development of the knowledge base serves two primary purposes. Firstly, it allows for the expansion and progression of existing knowledge. Secondly, rigorously constructing a comprehensive knowledge base avoids duplicate work, and relevant resources for addressing the research questions can be identified and utilized effectively. After identifying the problem environment and establishing the requisite knowledge base, as per the guidelines proposed by

Hevner et al. (2004), the next step involves the implementation phase, wherein an artifact is developed to address the identified problem.

2.2.4. DSR Implementation Research Questions (RQ5-6)

"As technical knowledge grows, IT is applied to new application areas that were not previously believed to be amenable to IT support" (Markus et al., 2002, p. 180)

As stated by Hevner et al. (2004), artifacts can take the form of mathematical models, concepts, architectures, or even running software. The objective of this dissertation is to develop a novel assessment framework for sensory marketing in the online domain, enabling self-assessment of the online communication quality of one's own e-commerce platform. Consequently, the artifact of this dissertation is an index to be created, which allows for the easy and efficient calculation of a sensory score for an e-commerce website based on artificial intelligence methods.

RQ5: *To what extent can an industry-specific online sensory marketing assessment be determined built on the knowledge base?*

To address this research question, an index model is initially created based on the knowledge base, abstracting and adapting methods from established scientific studies to the new problem environment. This index, referred to as the Online Sensory Marketing Index (OSMI) in later stages, serves as a preliminary version of the artifact, which is manually constructed as an intermediate result. However, its purpose is to be utilized for verifying the intended transition with artificial intelligence methods, as stated in the ORQ. It is important to emphasize that an early version of the OSMI was already introduced by the author of this dissertation in his unpublished master's thesis in 2018, but this version differs significantly from the version developed here.

Hence, one of the sub-goals in this dissertation, diverging from the master's thesis, is to create a proposal for weighting the index (in addition to implementing further items). This proposal considers the varying significance of human senses across industries and also distinguishes between online and offline sensory marketing (see section 5.1.1). In addition, the practicality of the OSMI will be

examined through a field study conducted by the author of this dissertation, involving four distinct industries and four company websites in each industry (16 websites in total). This study aims to demonstrate the OSMI's capability to assess the sensory communication of an e-commerce website and to facilitate comparisons of results within and across industries, thus identifying significant differences among the analyzed websites. Furthermore, the findings will be compared with those of experts who will be asked to apply the OSMI to a specific website example, ensuring the reproducibility of the results, as proposed by Hevner et al. (2004).

As mentioned before, the development of the artifact occurs with the support of the knowledge base. In the context of this dissertation, developing the intended final artifact involves examining the general implementability of establishing an index with the sensory indicators, which will initially be performed via manual procedures and subsequently automated. In conclusion, RQ6 asks for the latter:

RQ6a: To what extent is the automated identification, extraction, and assessment of online sensory marketing elements possible through artificial intelligence and big data?

To automate the assessment of e-commerce websites, the first step is to determine if it is feasible to crawl and download the e-commerce website´s sensory indicators derived from the knowledge base. These indicators encompass text, images, videos, audio, and interactive content. Once obtained, the focus of RQ6 is to analyze these contents and evaluate their sensory appeal automatically. This analysis involves applying specific methods that are tailored to each type of content. Considering the substantial amount of data involved, leveraging big data and AI becomes crucial for efficient crawling, processing, and analyzing.

Additionally, it will be examined whether the outcome of the automated assessment performs worse, identical, or even better than the OSMI score derived from the manual analysis. This evaluation intends to determine whether sensory automation reflects a meaningful measure not only in the procedural aspect but also in the interpretation of results.

Note that generating a comprehensive Big Data infrastructure falls outside the scope of this dissertation. Instead, the work is focused individually on testing the retrieval and analysis of data concerning sensory communication quality using

AI-based methods. Thus, the final artifact of this dissertation is a concept intended for measuring sensory content in the e-commerce domain through automated procedures. While this concept does not constitute a fully functional software solution, it serves as a framework that can be used by developers to complete such software. Primarily, this entails suitable measurement techniques that facilitate the adequate processing and evaluation of large quantities of sensory content in the e-commerce domain.

As explained in section 2.2.2, the target users of this assessment tool are online marketing managers who could incorporate it into their daily e-commerce activities, leading to RQ6b, which is defined as follows:

RQ6b: How can an interactive prototypical implementation look like that fulfills the benefits expectations of potential users?

Building upon the insights obtained regarding the practicability of conducting automatic assessments for each sensory content type, the subsequent objective is to develop and assess a prototype. This interactive prototype, also referred to as a mock-up, will illustrate and embody the knowledge acquired during the DSR implementation phase. The basic requirements for a prototype in the form of a mock-up application (hereafter used interchangeably) were previously discussed and compiled by the experts in the DSR environment. Subsequently, the prototype will be evaluated in the next and final stage, the evaluation phase.

2.2.5. DSR Evaluation Research Question (RQ7)

"The evaluation phase provides essential feedback to the construction phase as to the quality of the design process and the design product under development" (Hevner et al., 2004, p. 85).

According to Hevner et al. (2004), the feedback from individuals within the environment (see RQ1) where the problem or business need originated is an essential component for completing the DSR process via providing a sufficient artifact. The evaluation of the previous investigations in the form of the envisioned

sensory assessment approaches takes place to address the final RQ7. This concluding research question is formulated as follows:

RQ7: To what extent does the automated application of OSMI surpass manual analysis in terms of its potential to enhance work efficiency?

To address RQ7, the same experts who previously confirmed the business need will be engaged. This completes the circle by presenting these individuals with a solution approach in the form of an interactive prototype intended to address the environmental problem. Hence, the experts will once again be interviewed through a semi-structured interview to assess the extent to which their expectations regarding the sensory assessment tool have been met.

The creation of sensory e-commerce content currently still relies on manual processes, and there is no existing tool against which a conclusive efficiency evaluation of assessment approaches in this area of interest can be conducted. However, since the final artifact will be a prototype based on the feasibility of AI-based sensory e-commerce assessments, an efficiency comparison can be made between the manual OSMI approach (Artifact I) and the automated proposal (Artifact II). In this regard, a commonly used quantitative measurement method for assessing user experience will be applied to both approaches and compared to determine their significance.

Finally, RQ7 facilitates to answer the overarching research question (ORQ) of this dissertation.

III – MATERIAL AND METHODS

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This chapter delves into the essential materials and methods utilized in solving the problem outlined in this dissertation (see section II). The information systems research framework proposed by Hevner et al. (2004) serves as the underlying foundation for the dissertation, ensuring a design science research approach (DSR). The DSR process involves several methods to be presented here.

First, to establish a robust theoretical basis, the STIRL Literature Review Process by Buchkremer et al. (2019) will be introduced. In addition to the STIRL process, the systematic literature review (SLR) guidelines developed by vom Brocke et al. (2009) will be described that continue on the gathered literature corpus before. Vom Brocke et al.´s approach allows for a comprehensive evaluation and comparison of the derived scientific literature, uncovering key insights and the research gaps (see section 2.2.3).

Next, to gain qualitative expert insights, semi-structured interviews based on W.C. Adams' (2015) will be methodologically described for capturing qualitative data and specialized knowledge in the field of online marketing and e-commerce. Qualitative content analysis, following Mayring's (2004) technique, aids in analyzing the interview data, and the steps necessary will be presented.

In addition, the statistical techniques of factor analysis procedures are discussed to explore underlying variables and dimensions of sensory marketing-related e-commerce content from a business-to-consumer perspective to ensure that the derived sensory content aspects in digital domains are indeed relevant for a broad e-commerce audience.

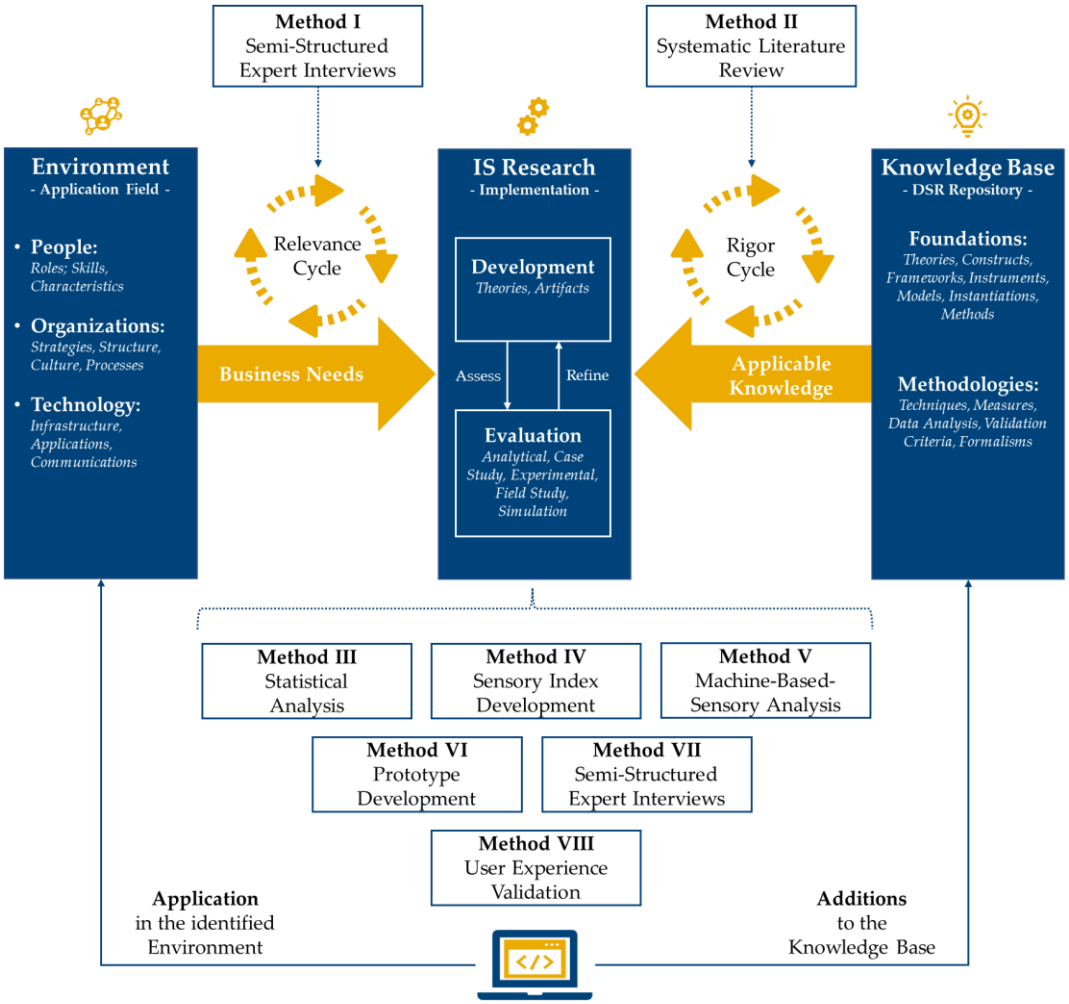
Based on this, options for machine-based sensory analysis of these contents are discussed, followed by the presentation of the user experience questionnaire that will finally be employed to capture the user-experience evaluations for overall user satisfaction with the artifacts to be developed.

This chapter concludes with a comprehensive discussion and holistically provides an overview of the materials and methods utilized throughout the research process, showcasing the systematic and rigorous approach taken to address the DSR-related research problem.

3.1. INFORMATION SYSTEMS RESEARCH FRAMEWORK

Figure 3 illustrates the conceptual framework for Design Science Research (DSR) proposed by Hevner et al. (2004) and employed in the present dissertation. According to Hevner, this framework is a supportive structure for comprehending, implementing, and assessing Information Systems (IS). It comprises three columns, namely the Environment, the Knowledge Base, and the Implementation, each encompassing three cycles. These three columns form the foundation of DSR and facilitate the development of an artifact that addresses an identified environment-related problem, also synonymously known as an environmental business need.

Figure 3. DSR Framework Adapted from vom Brocke et al. 2009



Within the three columns, three distinct cycles are carried out, namely the relevance cycle (see sections 3.4 and 3.5 for a detailed explanation of the methods utilized in this cycle), the rigor cycle (see sections 3.2 and 3.3 for details on the methods employed in this cycle), and the design cycle (see sections 3.6-3.8 for an elaboration on the three methods employed in this cycle). These cycles are undergone by scientific methodologies to effectively resolve the specified problem, as depicted in Figure 3, and can be described and placed in this research as follows:

- *Environment:* This consists of users in professional marketing practice, such as online marketing managers and web shop creators. They must certify that there is an existing problem or need for a tool that records, displays, and, ideally, evaluates a website's or web shop's sensory elements. Based on this assessment, improvement potentials for sensory communication in the e-commerce sector could be identified. Additionally, extensive literature research can be conducted by applying the systematic taxonomy for information retrieval from literature (STIRL) as introduced by Buchkremer et al. (2019). By examining an extensive data set of research articles, it is possible to identify trends and issues. In particular, a problem in the environment can also be confirmed with the STIRL framework.
- *Knowledge Base:* The foundation for the study is the manual Online Sensory Marketing Index (OSMI). The OSMI has been developed based on scientific findings on sensory marketing. The aim is to automate the OSMI as far as possible to automatically capture and evaluate individual elements such as texts, images, and videos with the help of Big Data analysis methods.
- *Information Systems (IS) Research:* The solution to the need identified in the environment forms an artifact. In the scope of this dissertation, the artifact should be a framework that, based on numerous tests, shows a user tool that only needs to be finalized as an app. However, to test the realistic feasibility of such a tool in advance, it is necessary to thoroughly investigate and evaluate sensory elements using artificial intelligence or big data methods.

Table 2. Design Science Research Guidelines Adapted to this Dissertation

Guidelines (GL) 1-7	***Description***	***Research Alignment***
GL1: Design as an Artifact	*DSR must produce a viable artifact manifesting as a model, construct, method, or instantiation.*	*The desired outcome of this dissertation is a new method to evaluate sensory communication in online environments, manually as well as automatically, via AI and big data methods, and therefore, based on producing an artifact in DSR.*
GL2: Problem Relevance	*The solution that is created has to address a relevant business problem within the DSR environment.*	*The relevance of evaluating and improving sensory communication in e-commerce environments has been revealed in chapter I and gets confirmed by experts in chapter VI.*
GL3: Design Evaluation	*Scientific methodologies need to be employed to assess the quality, utility, and efficacy of a design artifact.*	*Within section V, the theoretical framework and the scientific methodologies employed in this dissertation for designing and evaluating the targeted artifact are described and performed in detail.*
GL4: Research Contri-butions	*DSR has to serve the scientific area of interest by providing valuable contributions.*	*The dissertation itself will be published. Additionally, the data, coding, and prototype described in chapter V will be made available on request. Parts of the findings were also published by Hamacher & Buchkremer (2021, 2022b, 2022a).*
GL5: Research Rigor	*Rigorous methodologies must be applied throughout the construction and evaluation phases of the design artifact.*	*In chapter IV, there is a detailed explanation of the scientific methodologies employed in this dissertation to create and assess an artifact, thus showcasing a strong commitment to scientific rigor.*

GL6: Design as a Search Process	*DSR follows an iterative process that requires a well-defined cessation criterion.*	*The cessation criterion for the design artifact in this dissertation will be a new method to assess sensory elements in ecommerce manually and automatically, ultimately resulting in a mock-up for a new application. The developed artifact needs to be evaluated as efficiency increasing by experts in the field.*
GL7: Sharing of Research	*The successful transmission of DSR is crucial to facilitate comprehension among technical and managerial audiences.*	*The retrieved e-commerce data (e.g., text and images), coding files, and mock-up data will be made available on request to address the technology-oriented audience. Finally, the dissertation will also provide useful managerial-oriented implications in terms of applying sensory assessments with the developed artifact aiming at increasing business efficiency.*

Author's elaboration adapted from (Hevner et al., 2004, p. 83)

3.2. STIRL LITERATURE REVIEW PROCESS

In a scientific literature review (SLR), it is mandatory to adopt a systematic approach to analyze and evaluate relevant research. Though, the sheer volume of scientific articles amounts to approximately three million per year (Johnson et al., 2018; Thelwall & Sud, 2022), and scientists often face a significant time commitment when utilizing scientific literature. Selecting from the extensive array of resources can be challenging (Siddaway et al., 2019). Consequently, when trying to overview a topic of interest, these statistics indicate the obstacle of handling such a vast quantity of information through conventional human reading and learning methods. Nevertheless, some methodological approaches have been developed for a systematic literature search and review. Prominent sources in this area include the PRISMA method (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) introduced by Moher et al. (2010). PRISMA was originally developed for the field of health sciences but can also be applied in other disciplines where

systematic literature reviews and meta-analyses are conducted (Page et al., 2021). It defines an evidence-based approach that aims to increase the transparency of systematic literature reviews through a clear checklist of working steps within the review. The framework includes defining the research question, systematic literature search, selection of relevant studies, assessment of study quality, data collection and synthesis, and transparent reporting of results, and is typically conducted by a team of researchers (Booth et al., 2021).

Tranfield et al. (2003) present a more concise, three-stage process for conducting literature review research. The initial stage involves planning for the literature search. The second stage entails conducting the literature search and involves the identification, evaluation, and analysis of relevant literature. The final stage consists of documenting the findings from the second stage. While Tranfield et al.'s (2003) approach offers a systematic method, like PRISMA, it also necessitates the involvement of an expert panel to conduct the search for relevant literature. However, there are also systematic methods that researchers can use on their own to conduct an appropriate literature review, as proposed by Weber and Watson (2002). Nevertheless, the limiting component of this variant, however, is the need for time, resulting in low-efficiency research and the conclusion that the aforementioned review methods are not suitable best for this dissertation.

Despite the practical guidance for conducting scientifically rigorous literature reviews (Bandara et al., 2015; Denyer & Tranfield, 2009; Okoli, 2015), even within the field of information systems (Levy & Ellis, 2006; Wolfswinkel et al., 2013), the development of novel approaches for assessing publications becomes imperative. Machine-based approaches enable researchers to effectively identify pertinent knowledge within their respective research fields. One important source in this regard is Buchkremer et al. (2019), who propose a dual search and review method as an effective strategy for applying machine learning techniques. They emphasize the significance of employing a systematic taxonomy for information retrieval from literature (STIRL) to conduct comprehensive literature research. Buchkremer et al.'s (2019) proposal is appropriate for this dissertation because it allows for an automatic and (human) error-free examination of extensive research article collections followed by an analysis of large amounts of retrieved literature. To apply the STIRL method, relevant search strings must first be defined in a clear

manner. Clear search strings are formulated if room for any misinterpretation has been closed, especially regarding abbreviations. The problem of multiple meanings associated with abbreviations was examined by Buchkremer et al. (2019). Abbreviations like "POS," serving as an illustrative example, can stand for different meanings. While "POS" is commonly recognized as referring to "Point of Sale," it can also have the alternative interpretation of "Part of Speech." Consequently, it is advisable to refrain from employing abbreviations when formulating the search query to mitigate potential ambiguity.

The clearly defined search strings are then used to query online scientific databases, e.g., Web of Science, and subsequently export the search hits that match the search string. The exportable data containing the identified and relevant papers should ideally always contain identical details for each search hit. These include, for example, the title, the author(s), the type of paper (journal article, conference paper, review paper, book, etc.), the year of publication, the name of the editor (name of the journal, name of the conference, etc.), and the abstract. These criteria have been set as mandatory for the literature review in this dissertation (see section 4.3.1). Note that citation management software (Parabhoi et al., 2017), e.g., Mendeley or Zotero, should be used to double-check the status and correctness of the articles´ metadata by running an automatic update on the imported corpus.

After that, the updated corpus consisting of the potentially relevant papers needs to be analyzed by artificial intelligence methods related to text analysis (Manning et al., 2008). First, stop words are removed from the text corpus. Stop words are frequently used words in languages that have no relevance to the content but are semantic in nature and are consequently to be neglected for corpus analysis. Examples of such words are "among, over, before, in, but, or, a, the, for, still, or, yet, so, in, or similar stop words. The remaining words in the literary corpus now undergo a stemming process. Stemming traces the remaining words in the text corpus back to their respective common root forms (Balakrishnan & Ethel, 2014; Lovins, 1968). Thus, word variants contained in the corpus as such, like "market," "marketing," and "markets," are stemmed back to the root form "market." This approach ensures accurate categorization of scientific papers within the text corpus while minimizing the potential for analysis bias due to word variants. Once the stop words are eliminated, and the remaining words are traced back to their root

forms, the analysis can proceed to utilize artificial intelligence techniques, allowing the grouping of the relevant literature into topics.

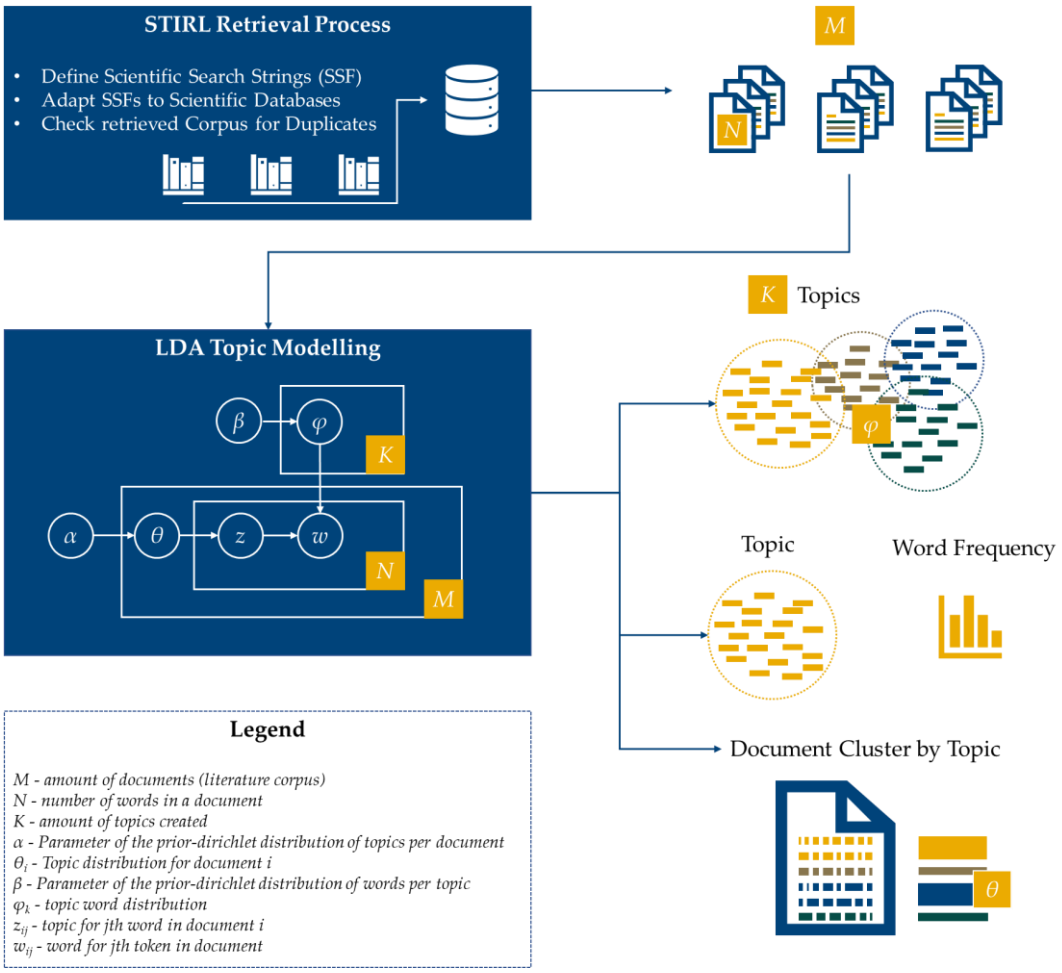
For this purpose, an independent document labeling technique can be applied (Erhan et al., 2010), such as Latent Dirichlet Allocation (LDA), which is a widely used statistical model for topic modeling in the field of natural language processing (Blei et al., 2002) and therefore employed within STIRL. LDA assumes that a corpus is a mixture of several topics, each represented by a probability distribution over words. The main goal of LDA is to identify the latent topics and their corresponding proportions in a retrieved text corpus based on likelihoods. By examining the statistical properties and co-occurrence patterns of words, LDA facilitates the identification of the underlying topics inherent in the dataset. The model iteratively assigns words to topics and adjusts the topic assignments based on the observed word distributions in the given corpus. Used in a variety of domains, such as text mining, information retrieval, and document classification, LDA provides researchers with a comprehensive understanding of the content and organization of large text datasets. Nevertheless, it is important to note that the LDA technique assumes that documents with common topics tend to use similar word groups. Consequently, a document can be associated with multiple topics simultaneously. The assignment to topics is done according to a scheme presented below, illustrated by the example of online sensory marketing. Each topic of LDA grouping is based on probabilities for certain word associations. For example, based on two different topics, visuality, and acoustics, words such as "color," "image," and "design" may have higher probabilities in the visuality topic, while words such as "sound," "music," and "audio" may have higher probabilities in the audio case and can be illustrated with a fictitious sentence like:

Sentence I: "The website presents bright colors and visually appealing graphics that catch the user's attention." Sentence one is dominated by words that refer to visual elements, indicating a strong association with visuality. In addition, the mention of bright colors and visually appealing graphics logically fit well with this theme in terms of content, indicating that the document is correctly assigned to the category.

Sentence II: "The website features a pleasant audio background that creates an immersive experience for visitors." Here, the emphasis is more on the auditory aspect, with words like "audio background" and "immersive experience," indicating a stronger

connection to acoustics. While visual elements are on the site, the auditory word dominance suggests that the document belongs to the auditory theme.

Figure 4. STIRL and LDA Topic Modeling Process



Author's elaboration, adapted from Amara et al. (2021, p. 3057)

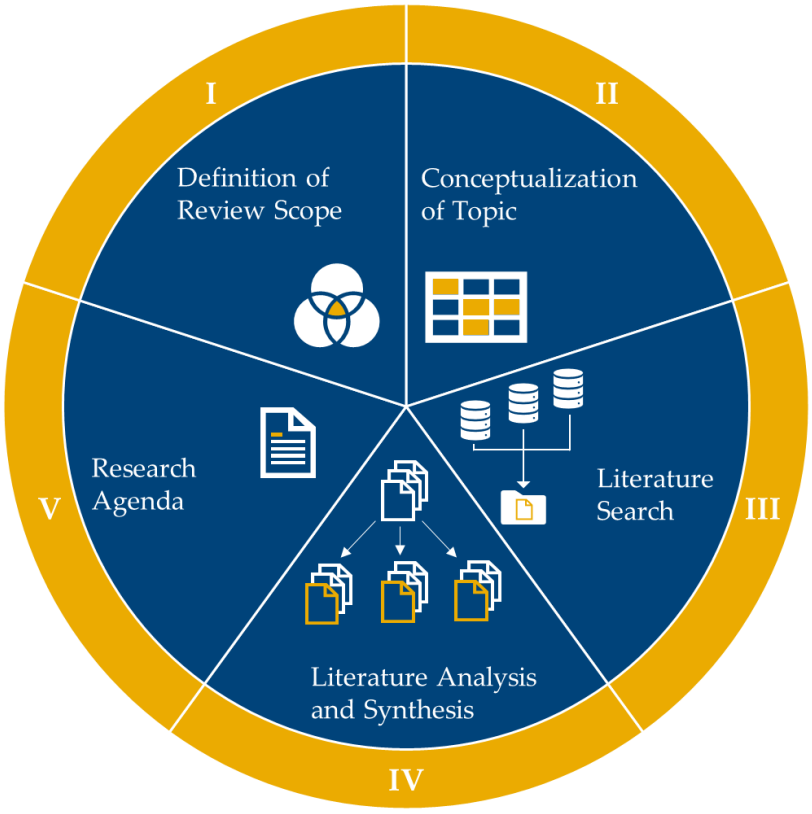
As shown in Figure 4, documents can be analyzed based on the frequency of, e.g., sensory words. In this way, they can be classified into relevant topics to obtain a systematic overview of the relevant literature, which is structured according to time-related trending topics (Kontostathis et al., 2004). Hence, LDA as the essential STIRL methodology is applied in this dissertation due to its efficient summarizing and understanding of the majority of the scientific literature (Buchkremer et al., 2019), with a special focus on sensory marketing-related topics (see section 4.3.1).

3.3. SYSTEMATIC REVIEW OF THE SCIENTIFIC LITERATURE

Scientific literature reviews (SLR) are essential in highlighting the importance and relevance of a research area. Literature review goals vary broadly, including obtaining new research, consolidating existing knowledge, and identifying commonly used research techniques or methods (Hart, 1998; Onwuegbuzie et al., 2012). Unlike other empirical analyses, there are few comprehensive and systematic methods or standardized approaches developed specifically for SLRs (vom Brocke et al., 2015; Wolfswinkel et al., 2013). Therefore, vom Brocke et al. (2009) developed a novel framework for the literature review process that focuses specifically on the literature search subprocess. Vom Brocke et al.´s (2009) framework has gained widespread acceptance in the field of review theory, as discussed by Paré et al. (2015), mainly due to its ability to allow for freedom in conducting domain and process-specific investigations (Burggräf et al., 2020), aiming at extracting information that suggests a new contribution to knowledge (Jesson et al., 2011), and reproducibility (Bandara et al., 2011). In the context of SLRs, this dissertation incorporates the framework proposed by vom Brocke et al. (2009), in addition to utilizing the STIRL method and LDA text grouping. This framework offers a systematic approach with specific phases designed to ensure the quality, reliability, and validity of the manual SLR process. While the STIRL and LDA methods are intended to fulfill these objectives, it is possible that the AI-generated text corpus could include articles containing keywords or key terms such as sensory marketing, assessment framework, or sensory evaluation, among others. However, these keywords might also pertain to domains outside the research scope of this dissertation. Consequently, a manual review of the relevant articles is planned to verify that the literature identified by the AI-based STIRL method is appropriate for inclusion in the SLR to increase scientific rigor (Levy & Ellis, 2006; Pateli & Giaglis, 2004). It should be noted that LDA may not detect these subtle semantic nuances, potentially leading to incorrect classification of the identified scientific work as relevant.

Hence, according to Brocke et al.´s (2009) framework, conducting SLR includes a circular five-phase review process driven by the continuous growth of knowledge that can render previous literature reviews obsolete and require reexamination and updating. The review process is illustrated in Figure 5.

Figure 5. Systematic Literature Review Framework



Author's elaboration adapted vom Brocke et al. (2009, p. 7)

Within the *first phase*, vom Brocke et al. (2009) apply an established classification scheme in addition to the literature review process to accurately define the scope of the review (the defined research question). They recommend using the taxonomy proposed by Cooper (1988), which includes six characteristics, each consisting of specific categories. While some characteristics are mutually exclusive (perspective and scope), others can be combined (audience, organization, objective, and focus) and presented in detail below:

- The first category, *focus*, refers to the specific aspect on which the literature review focuses. This involves identifying and articulating the central theme, theory, methodology, or phenomenon that is the review's focus. The focus provides clarity and guides the selection of relevant literature to be included.

- The *goal* category encompasses the intent of conducting the literature review. It defines the objective(s) to be achieved by the review, such as summarizing the current state of knowledge, identifying research gaps, critically evaluating existing theories, or deriving practical recommendations. The goal provides the general direction and scope of the literature review.
- The *organization* refers to the structure and outline of the literature review. There are several approaches to this, such as a chronological outline, a conceptual outline, or an outline based on research methods. The choice of outline depends on the nature of the research question and the study's goals.
- The *perspective* category relates to the point of view of the literature review. Consideration should be given to whether the review presents a neutral and comprehensive view that considers multiple perspectives and interpretations or whether it focuses on a particular theoretical or methodological perspective. Perspective influences the analysis, synthesis, and interpretation of the literature.
- The *audience* represents the intended readers or recipients of the literature review. It indicates the intended audience, including researchers, practitioners, policymakers, or a broader community of scholars. Knowing the intended audience helps tailor the language, analysis depth, and expertise level to convey the report's findings and implications effectively.
- *Coverage* refers to the scope and range of the literature review. It includes the selection criteria for having relevant sources, the time span of the studies considered, and the consideration of different geographic regions or research approaches. Coverage ensures the review includes a comprehensive body of literature to answer the research question adequately.

In conclusion, Cooper's Taxonomy of Literature Review (1988) is included in vom Brocke et al.´s (2009) first phase because it provides a structured framework

that improves the clarity, coherence, and scientific rigor of SLRs, contributing to the advancement of knowledge in the subject area (Garfield, 1987).

During the *second phase*, *conceptualization of topic*, this dissertation takes a unique approach as described in section 3.1 by integrating the literature review proposed independently by vom Brocke et al. (2009) and Buchkremer et al. (2019). Consequently, as outlined earlier, the traditional first and second Phases of the literature framework are superseded by the results derived from the AI-based STIRL approach. Generally, in this phase, the focus shifts toward conceptualizing the analysis, where the SLR search string and databases are deliberately defined.

The *third phase* involves conducting the *literature search* as suggested by vom Brocke et al. (2019). Conducting both a "backward" and a "forward" search is recommended to improve the search process. In the backward search, one starts from a known literature source and examines previous relevant work. This can be accomplished by examining the related works section of a paper. On the other hand, forward searches look for more recent articles related to a known reference source (Webster & Watson, 2002). Scientific online databases serve as the main data source for this search process. These databases offer citation features to explore research, allowing the identification of authors who have referenced the article.

The *literature analysis and synthesis* form the *fourth phase* of the framework. The analysis and evaluation are intended to select the identified literature for relevance. As described by vom Brocke et al. (2019), it is recommended to examine the title, the abstract, or (ideally) the full text.

In the *fifth and final phase*, the *research agenda*, the research findings are documented in a concept matrix (Salipante, 1982). Specifically, Weber and Watsons´s (2002) concept matrix adapted to the topic of interest in this dissertation will be utilized. This matrix categorizes the literature based on the concepts it contains. The names of the articles studied are shown on the y-axis of the concept matrix, while the x-axis represents the concepts described in those articles. If an article on the x-axis contains a concept from the y-axis, this is summarized and marked in the concept matrix. Hence, the concept matrix facilitates the establishment of links between articles and their corresponding concepts. This mapping allows the identification of common themes, the emergence of patterns between researched articles, and the discovery of research gaps. Consequently,

articles in the concept matrix that have no, or few associated concepts are examined to identify research gaps.

3.4. SEMI-STRUCTURED EXPERT INTERVIEWS

There are several possible scientific methods for conducting and presenting both the problem relevance (2nd DSR guideline) and artifact assessment (3rd DSR guideline) that will be developed in this dissertation. These include both quantitative methods, such as user surveys, and qualitative research in the form of interviews. Conducting qualitative research is suggested as appropriate for the scope of the dissertation because it is a relatively unexplored gap in research, as discussed in Section 2.2.

Opinions and more in-depth expert expressions on specific topics can adequately occur within the context of qualitative research (Moser & Korstjens, 2017). However, qualitative research is also diversifiable, and an a priori decision of the methodology best suited to the dissertation must be chosen. Possible methods for the detailed elicitation of opinions could be, in particular, focus groups, according to Krueger (2014), structured interviews, semi-structured or unstructured interviews. Each of these methods contains several advantages and disadvantages, and the method to be selected primarily depends on the individual research scope and goal(s) (A. Adams & Cox, 2008).

For instance, existing research indicates that focus groups may not provide the same level of depth as other research methods, such as interviews (A. Adams & Cox, 2008). As mentioned in section 2.2, this dissertation emphasizes engaging in individual discussions with experts to gain insights into their comprehension and personal preferences regarding sensory marketing in the online domain and to thoroughly examine if the DSR problem raised in section 2.2.2 will be confirmed. Consequently, the decision was made to forgo conducting a focus group discussion and instead opt for expert interviews during the environmental and evaluation phases. Based on the RQs one and seven of this dissertation, semi-structured interviews (SSIs), according to W.C. Adams (2015), are chosen instead. SSIs are often seen as a synthesis of the advantages of structured and unstructured interview approaches and thus represent an adequate compromise. By incorporating criteria from structured interviews, semi-structured interviews

facilitate obtaining comparable and reliable data. In addition, they retain the flexibility of unstructured interviews, allowing to ask follow-up questions if needed (Rabionet, 2011).

To meet the desired interview set up of only recruiting experts in the field of the DSR problem environment (Meuser & Nagel, 2009), it is crucial to carefully select them and define criteria to evaluate if the expert status is met. Thus, the expert criteria are carried out in section 4.2.1.4.

3.5. QUALITATIVE CONTENT ANALYSIS

Handling qualitative data in the form of SSIs obtained in this dissertation efforts a common scientific strategy. One of the most prominent researchers in analyzing qualitative data is Philipp Mayring, who developed and presented a five-phase content analysis approach for that purpose (Mayring, 2000, 2004).

According to Mayring, qualitative text data needs to be investigated through the following phases, which will next be separately discussed and specified in terms of the dissertation's goals:

(1) Phase: Select material

Firstly, the material must be selected that applies to answering the dissertation's research questions. As explained earlier (see section 3.1), both quantitative and qualitative research methods are used in the dissertation. Therefore, the application of Mayring's qualitative content analysis refers in particular to the research of a business need in the DSR-related environment of online marketing and to the final evaluation of the subsequently developed artifact. As a result of this, Research Questions 1 and 7 are answered. In addition, RQ7 will be supplementary investigated through a mixed-methods approach (Tashakkori & Teddlie, 1998), including a quantitative evaluation based on the user experience questionnaire (UEQ) to obtain significant differences in UX evaluation among two related but different artifacts.

(2) Phase: Determine the direction of the analysis

Within the second phase, the overall aim of the qualitative content analysis and the matter of interest (persons, scenarios, methods, etc.) must be defined. Accordingly, within this dissertation, SSIs are conducted to gain extensive insights from experts in the field of online marketing in order to answer the aforementioned RQs, which are raised according to the design science research process (Hevner et al., 2004).

(3) Phase: Select form of content analysis

The third phase includes the a priori decision of how the text data should be categorized. Mayring (2019) differentiates between inductive and deductive categorization, which must be aligned with the goal of conducted research. The respective properties can be divided as follows (Hsieh & Shannon, 2005):

Inductive content analysis follows an exploratory exploration of the textual data at hand, deriving categories and themes directly from the data. It involves immersion in the text, open coding, identifying patterns, and gaining insights without preconceived theories. It allows for a flexible approach to uncovering new insights based on qualitative data, e.g., semi-structured interviews.

In contrast, a *deductive content analysis* corresponds to a structural qualitative content analysis since already existing theories or models are used to analyze text data. It involves coding based on predefined categories and concepts and allows for the testing and confirmation of hypotheses or research questions.

According to Kuckartz (2007), however, mixed forms frequently occur where deductive top-level categories are derived and formed from theory during the development of the interview guideline. These top-level categories serve as a framework for the development of a category system, according to Mayring (2000), and are differentiated and specified during data analysis and evaluation. In summary, inductive top-level categories are modified and supplemented during the coding process, and subcategories are formed.

(4) Phase: Interpret results

In this dissertation, both inductive and deductive approaches are employed for qualitative analysis, and a category system will be established to which the total of the interview text data will be allocated. The formation of categories is accomplished by extracting categories from the observed interview content, which is a process driven by inductive reasoning. Additionally, pre-established categories from existing literature are utilized, employing a deductive approach (Bernard et al., 2016).

(5) Phase. Ensure quality criteria

The fifth and last phase of Mayring´s qualitative content analysis method involves the maintaining of the research´s required scientific quality. Ensuring the scientific quality of qualitative research analyses involves three important aspects. First, *transparency* is critical in the clear and unambiguous presentation of results. This includes accurately measuring the intended variables of interest and avoiding any ambiguity in the measurement process.

Another essential aspect is *coverage*, which refers to the reproducibility of qualitative content analysis. Consequently, it verifies whether the analysis can be successfully replicated if the study is repeated. This procedure ensures that the results can be independently inspected and contribute to the scientific record.

Lastly, *intersubjectivity* is the third important criterion in qualitative research. It refers to the shared understanding of the individuals involved in the study. It is important in determining whether two people share a common interpretation and understanding of an object or concept. Intersubjectivity helps provide a solid foundation for reliable communication and agreement on the definition of the object of study. Addressing these aspects of scientific rigor in qualitative research promotes robustness, credibility, and trustworthiness (Mayring, 2004).

3.6. FACTOR ANALYSIS

To complement the knowledge base with an additional perspective before developing an artifact (Hevner et al., 2004), it is pertinent within the scope of this dissertation to illuminate a B2C perspective on the significance of various sensory elements in the online consumer journey. Therefore, alongside the already identified B2B perspective and combined private insights into the search behavior of surveyed experts, a broader mass of consumers will be surveyed to verify the importance of the collected potential sensory e-commerce components. To achieve this, factor analysis will be conducted through the administration of two online surveys to ascertain the level of importance attributed to sensory elements.

Factor analysis is a widely utilized statistical method aimed at revealing underlying dimensions within a set of observed variables (Churchill, 1979). It is applied across diverse disciplines, including social sciences (Mackenzie & House, 1979), to simplify complex data by identifying common patterns and grouping variables based on their intercorrelations (Hair et al., 2013).

This dissertation will apply two main types of factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA serves as an initial step in comprehending the structure of the data. It does not impose any pre-defined factor structure but rather enables the detection of underlying dimensions (Fabrigar et al., 1999). Various extraction methods exist to explore and identify a factor structure within the obtained data, with established methods such as principal component analysis (PCA) or maximum likelihood estimation. However, it is important to note that PCA is not a strictly factor-based method but rather a variance-maximizing technique, often erroneously equated with factor analysis (Bryant & Yarnold, 1995; Joliffe & Morgan, 1992).

To conduct an EFA, it is necessary to first test whether the survey data are suitable for factorization. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity are utilized for this purpose. The KMO statistic assesses sampling adequacy, indicating the proportion of variance in the observed variables that can be attributed to common factors (Hair et al., 2014). A KMO value above 0.7 is generally considered acceptable (J.-O. Kim & Mueller, 1978). Additionally, measures of sampling adequacy (MSA) and measures of sampling variance (MSV) are used to evaluate the data's suitability for factor analysis. Higher MSA values

and lower MSV values indicate more reliable results. If these values meet the statistical guidelines and are deemed suitable, an EFA can then be performed.

Next, Rotation plays a crucial role in factor analysis as it facilitates the interpretation of the identified factors. The objective of rotation is to achieve a simple and interpretable factor structure by minimizing cross-loadings, where variables exhibit high loadings on multiple factors (Hair et al., 2013). Common rotation methods include Varimax, Oblimin, Quartimax, and Promax. Varimax rotation produces orthogonal factors (uncorrelated), simplifying interpretation. Oblimin, Quartimax, and Promax rotation allow for correlated factors, which may be more appropriate depending on the research context and the expected relationships between the factors. Factor loadings above >.30 are considered significant, >.40 are considered important, and >.50 are considered highly significant, regardless of the chosen rotation method (Bagozzi & Yi, 1988; Hair et al., 2013). However, no universally accepted strict cut-offs exist; their selection is based on judgment, prior research, and the purpose of the study (Aladwani & Palvia, 2002).

After conducting the EFA, it is essential to assess the reliability of the identified factor structure. Reliability analysis is crucial for evaluating the internal consistency of the observed variables within each factor using Cronbach's alpha (Cronbach, 1971), which measures the extent to which variables within a factor consistently measure the same construct. Higher values of Cronbach's alpha (e.g., above .70) indicate greater internal consistency and reliability (Churchill, 1979; Hair et al., 2013; Peterson, 1994).

Following the EFA, one can proceed to CFA to further validate and refine the initially proposed factor structure. The objective is to test whether the observed data fit the proposed factor structure. This is accomplished by evaluating goodness-of-fit indices (Bentler & Bonett, 1980), such as the chi-square test, comparative fit index (CFI), and root mean square error of approximation (RMSEA) (Hu & Bentler, 1999). CFA confirms the presence of the hypothesized factors and assesses the strength and significance of their relationships. Moreover, factor analysis helps determine the convergent and divergent validity of the factors. Convergent validity is demonstrated when variables within the same factor exhibit high loadings and share a common underlying construct. Divergent validity is

evident when variables in different factors have low intercorrelations, indicating that they measure distinct constructs (Campbell & Fiske, 1959). Convergent validity is assessed by the average variance extracted (AVE), which, according to Fornell and Larcker (1981), should reach a value of at least .50 to confirm that the identified factors measure distinct constructs. To analyze discriminant validity, the maximum shared variance (MSV) is compared to the AVE, and the rule MSV < AVE needs to be met (Hair et al., 2013). Another rather new statistical approach is the heterotrait-monotrait ratio of correlations (HTMT) developed by Henseler et al. (2015). HTMT serves as an indicator to assess the similarity between latent variables, and if its measures are significantly less than one, it indicates that discriminant validity has been successfully demonstrated (Franke & Sarstedt, 2019).

3.7. MACHINE-BASED SENSORY ANALYSIS

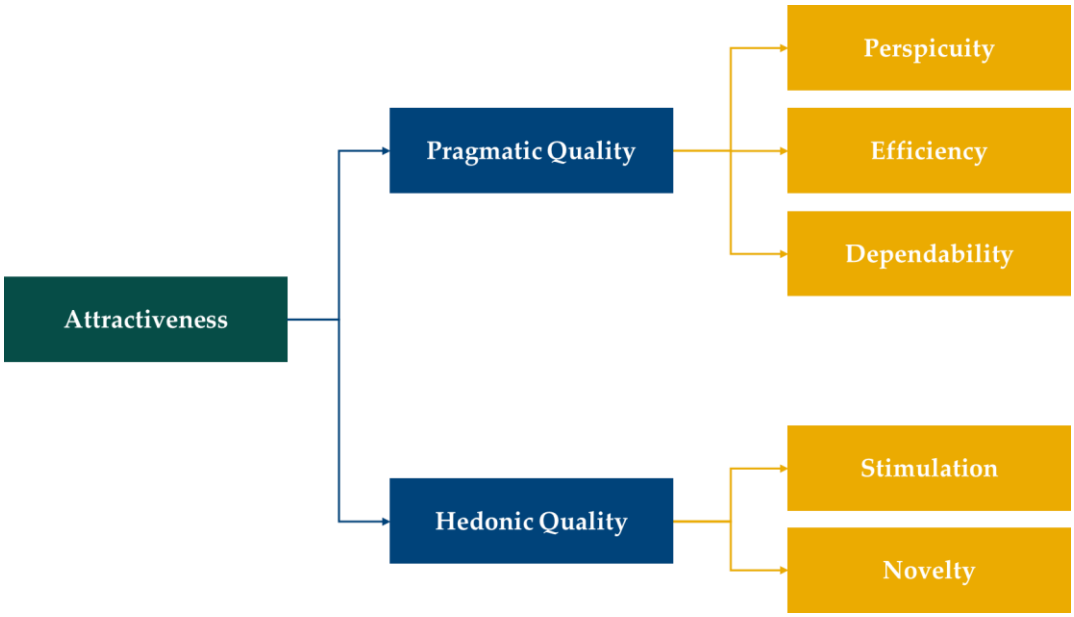
To analyze sensory e-commerce content using machine-based methods, various techniques of machine learning and artificial intelligence are required. Specifically, machine-based analyses focused on the topic of sensory aspects in the e-commerce domain are still relatively scarce. While there have been studies exploring the use of AI in areas such as Food Science, early works by Goyache et al. (2001) have assessed the utility of AI for quality evaluation in the food industry, and others have explored the prediction of sensory responses to food products (Kakani et al., 2020; Koyama et al., 2021; Nunes et al., 2023). In this dissertation, methods of computer-assisted retrieval, processing, analysis, and final evaluation of sensory e-commerce content are tested and applied within the DSR process. Separate AI methods are employed to capture and assess textual, visual, auditory, interactive, and video-based content. Section 4.1.2 outlines the fundamental principles of the methods used, including NLP and CNNs and their specifications.

Despite the convenience of computer-assisted analysis of sensory content, it initially involves significant manual effort and requires substantial computational power. Hence, the author of this dissertation receives student support in executing early operational steps (method selection, crawling, processing). Hence, the scope of this dissertation does not include creating a comprehensive big data infrastructure but rather focuses on examining and evaluating the specific technical necessities of sensory analysis independently, aiming at creating a DSR artifact.

3.8. USER-EXPERIENCE EVALUATION

In the context of the DSR Guidelines, the last phase describes evaluation as a crucial step in verifying a developed artifact. In this dissertation, the User Experience Questionnaire (UEQ) will be applied, which is a widely recognized measurement tool designed to assess user experience in software and websites. Developed by Laugwitz et al. (2006, 2008), the UEQ provides a comprehensive framework for assessing users' subjective perceptions of usability, aesthetics, and overall satisfaction directly retrieved from users of the target (e.g., a website) to be investigated. The development of the UEQ involved a meticulous process that combined scientific methodologies and user-centered approaches. Initially, an item pool was created from existing UX questionnaires and refined based on feedback from experts and users. Through factor analysis and item selection, the final version of the UEQ was established, consisting of 26 items distributed across six dimensions (Laugwitz et al., 2006, 2008). These six dimensions are depicted below in Figure 6, revealing that they can be subordinated to first-order factors of pragmatic quality, consisting of perspicuity, efficiency, and dependability, as well as hedonic quality expressed by stimulation and novelty.

Figure 6. User-Experience Questionnaire (UEQ) Scale Structure



Author's elaboration, adapted from (Rauschenberger et al., 2013, p. 104)

The UEQ dimensions offer a holistic view of the user experience, which can be divided into the subsequently presented scales (Rauschenberger et al., 2013):

- *Attractiveness* captures the system's aesthetic appeal, including visual design and overall impression. It evaluates how the interface engages users and elicits positive emotional responses.
- *Perspicuity* focuses on the clarity and comprehensibility of the system. It assesses how well users can understand the system's functions, features, and information architecture.
- *Efficiency* refers to the ease and speed with which users can accomplish tasks within the system. It addresses factors such as task completion time, minimal effort required, and effective utilization of system resources.
- *Dependability* assesses the system's reliability, stability, and error handling. It considers aspects such as system responsiveness, error prevention, and error recovery.
- *Stimulation* measures the extent to which the system provides users with engaging and enjoyable experiences. It evaluates factors such as interactivity, feedback, and the system's ability to hold users' attention.
- *Novelty* explores the perceived innovativeness and uniqueness of the system. It focuses on users' perceptions of the system as distinct from other similar systems they have encountered.

While the UEQ is widely accepted, it is important to consider and possibly delineate other measurement instruments in the field of user experience research. One notable instrument is the System Usability Scale (SUS), developed by Brooke as *"a quick and dirty usability scale"* (Brooke, 1996, p. 4). The SUS focuses on measuring the usability aspect of user experience. It consists of ten items that assess the user's perception of system usability, such as ease of use, learnability, and efficiency. The SUS has been widely adopted due to its simplicity and effectiveness in providing a global measure of usability (Brooke, 2013; Schrepp et al., 2014).

Table 3. User Experience Questionnaire based on Laugwitz et al. (2008)

Item	*Description Left*	*Likert-Type*	*Description Right*	*Scale*
1	*annoying*	o o o o o o o	*enjoyable*	*Attractiveness*
2	*not understandable*	o o o o o o o	*understandable*	*Perspicuity*
3	*creative*	o o o o o o o	*dull*	*Novelty*
4	*easy to learn*	o o o o o o o	*difficult to learn*	*Perspicuity*
5	*valuable*	o o o o o o o	*inferior*	*Stimulation*
6	*boring*	o o o o o o o	*exciting*	*Stimulation*
7	*not interesting*	o o o o o o o	*interesting*	*Stimulation*
8	*unpredictable*	o o o o o o o	*predictable*	*Dependability*
9	*fast*	o o o o o o o	*slow*	*Efficiency*
10	*inventive*	o o o o o o o	*conventional*	*Novelty*
11	*obstructive*	o o o o o o o	*supportive*	*Dependability*
12	*good*	o o o o o o o	*bad*	*Attractiveness*
13	*complicated*	o o o o o o o	*easy*	*Perspicuity*
14	*unlikable*	o o o o o o o	*pleasing*	*Attractiveness*
15	*usual*	o o o o o o o	*leading edge*	*Novelty*
16	*unpleasant*	o o o o o o o	*pleasant*	*Attractiveness*
17	*secure*	o o o o o o o	*not secure*	*Dependability*
18	*motivating*	o o o o o o o	*demotivating*	*Stimulation*
19	*meets expectations*	o o o o o o o	*does not meet expectations*	*Dependability*
20	*inefficient*	o o o o o o o	*efficient*	*Efficiency*
21	*clear*	o o o o o o o	*confusing*	*Perspicuity*
22	*impractical*	o o o o o o o	*practical*	*Efficiency*
23	*organized*	o o o o o o o	*cluttered*	*Efficiency*
24	*attractive*	o o o o o o o	*unattractive*	*Attractiveness*
25	*friendly*	o o o o o o o	*unfriendly*	*Attractiveness*
26	*conservative*	o o o o o o o	*innovative*	*Novelty*

Compared to the UEQ, the SUS has a narrower focus, primarily evaluating the usability aspect of user experience, while the UEQ offers a comprehensive assessment by considering six dimensions. The UEQ encompasses aesthetics, usability, and emotional aspects, providing a more holistic understanding of the user's subjective perceptions. Furthermore, the development process of the SUS involved iterative testing and statistical analysis to establish its reliability and validity. Although the UEQ and SUS share the same scientific rigor, the SUS is a more streamlined and efficient instrument for measuring usability due to its pure emphasis on usability and its shorter item set.

Another tool to measure UX is the Usability Metric for User Experience (UMUX), which focuses on overall usability and user satisfaction (Finstad, 2010). Further developed by Lewis et al. (2013, 2015), the UMUX(-Lite) consists of four simple items that assess satisfaction and the likelihood of recommending the investigated software product. The UMUX differs from the UEQ in a few ways. Firstly, the UMUX provides a concise measure of the user experience (Lewis, 2018). In contrast, the UEQ offers a more comprehensive assessment, considering aesthetics, usability, and emotional aspects. Secondly, the UMUX has a narrower focus on usability, while the UEQ explores various dimensions of user experience in greater depth.

In conclusion, the User Experience Questionnaire (UEQ), System Usability Scale (SUS), and Usability Metrics for User Experience (UMUX) are valuable tools for measuring user experience related to software as well as websites (Borsci et al., 2015). The UEQ provides a comprehensive framework covering multiple aspects of user experience, while SUS focuses specifically on usability, and UMUX provides an accurate measure of overall usability and satisfaction. By considering the strengths and differences of the described tools, the UEQ will be applied in this dissertation due to its more in-depth understanding of a holistic UX analysis while taking into account that the test persons do need more time to answer the 26-item related UEQ instead of shorter measurement options.

3.9. DISCUSSION

Various techniques exist for quantifying and assessing user experience (UX). One commonly employed approach is usability testing (Nielsen, 1994), which utilizes quantitative indicators, such as the number of observed issues and the time required for participants to complete tasks, to gauge the quality of UX in a product (Schrepp et al., 2014). However, this method demands substantial effort, including identifying suitable participants, task and test system preparation, and test site setup. Consequently, the typical sample sizes tend to be quite small, for instance, around 10-15 users (Schrepp et al., 2017). According to Schrepp et al. (2017), conducting comprehensive evaluations employing multiple questions may prove advantageous. Consequently, this dissertation adopts a combination of methods to assess the two artifacts under consideration. The chosen approach employs the UEQ as a quantitative measurement method, complemented by qualitative expert interviews following W.C. Adams' guidelines (2015). This mixed-methods approach is widely employed in scientific research (Tashakkori & Teddlie, 1998).

The subsequent chapter IV, the theoretical framework, is dedicated to establishing the scientific basis of this dissertation, which means creating the DSR knowledge base needed to build the aimed artifact. Accordingly, the basic definitions and contextual background are presented first. Following these definitions, the dissertation will outline its scope through the utilization of semi-structured expert interviews. Building on the defined scope, a comprehensive literature review and analysis involving STIRL will be conducted, including conceptual, historical, and methodological perspectives on the body of scholarly literature sought. Finally, the last part of this section highlights the connections and differences between this dissertation and previously published work.

IV – THEORETICAL FRAMEWORK

IV -THEORETICAL FRAMEWORK

The objective of this chapter is twofold: to establish the requisite knowledge base within the framework of design-science research guidelines and to explore the DSR environment prior to developing a problem-solving artifact, specifically a sensory assessment approach for digital marketing and e-commerce. To achieve this, chapter IV delves into the theoretical framework employed to identify fundamental theories and methodologies for addressing the business need outlined in this dissertation. The theoretical framework presented herein is divided into five research segments.

The first section presents the definitions and theoretical foundations of sensory marketing, e-commerce, and artificial intelligence, which form the essential backdrop for this dissertation. After that, employing the methodology described in section III, the scope of this dissertation is explored through the implementation of Semi-Structured Interviews (SSIs). The third section encompasses a manually performed Systematic Literature Review (SLR) that utilizes artificial intelligence techniques to categorize the previously gathered scientific literature. Building upon the findings of the SLR, this section aims to identify the research gap.

The fourth section situates this dissertation within the identified relevant literature to further validate the research gap and to contextualize and delineate the work within the scientific research streams, with the goal of avoiding duplicative efforts. This analysis aids in the development of the artifact and ensures its novelty. The fifth and final phase involves conducting surveys and subsequent factor analyses, with the objective of determining the significance of sensory communication components in e-commerce from a business-to-consumer (B2C) perspective. This last section is intended to identify and retain the most pertinent sensory elements for the artifact to be developed in ensuing chapter V.

Following the completion of these phases, chapter IV concludes with a comprehensive discussion of the aforementioned findings and their implications.

4.1. DEFINITIONS

This subsection offers an extensive examination of the fundamental definitions and concepts within this dissertation. In addition to sensory marketing, specific concepts of artificial intelligence, namely convolutional neural networks, natural language processing, word embeddings, and their respective techniques, are presented. Subsequently, the scope expands to encompass the framework of e-commerce, along with the closely associated online consumer experience and business-oriented user experience of software solutions.

4.1.1. Online Sensory Marketing

Sensory marketing, as introduced earlier in this thesis, was primarily shaped by Krishna (2012), as her definition of the concept has established itself in the scholarly context. She describes this subfield of marketing as the deliberate sensory consumer engagement designed to influence perception, judgment, and customer behavior through sensory communication. However, an increasingly important business area, namely digital marketing and thus e-commerce, has been omitted from this description. Subsequent research works have been more specifically focused on the design of sensory online shopping experiences, grouping them under the term Digital Sensory Marketing (Petit et al., 2019), highlighting the field of sensory marketing in the online context. However, the term Online Sensory Marketing (OSM) is also used synonymously (C. Adams & Doucé, 2020), which has been selected as the underlying description for this dissertation.

For OSM, it is vital to emphasize that sensory interaction in online environments has traditionally been limited to visual and auditory inputs, resulting in an online atmosphere where sensory cues are generally severely lacking (Petit et al., 2022). Therefore, success depends on sellers' ability to combine textual and visual stimuli on e-commerce websites to effectively convert visitors into buyers (Bleier et al., 2019). As Doucé et al. (2022, p. 1) stress in this regard, that

"There is a need to investigate how the available senses can be used to trigger perceptions via the absent senses (e.g., via cross-modal correspondences)."

The importance of crossmodal correspondences was already explained in section 1.3.3, with the specific assignment of research contributions predominantly from

the field of psychology to the area of sensory imagination. Ultimately, it is sensory imagination that leads consumers to indirectly experience other stimuli through the perception of available sensory cues (Elder & Krishna, 2022) - for example, when reading a descriptive text that stimulates how a flavorful coffee smells in the morning or a fresh sea breeze. This sensory middle ground can thus be utilized to mitigate the limitations of the online marketing environment and create an immersive and more vivid experience for online consumers (Doucé et al., 2022).

Consequently, the core area of OSM is the active design of the shop environment and the sensory contents contained to be implemented, such as texts, images, audio, videos, 3D product visualizations, or interactive content such as virtual try-on functions, also known as augmented reality (AR) implementations. Especially with the latter, a more dynamic and engaging experience for consumers can be created (Gatter et al., 2022; Rauschnabel et al., 2019).

Nevertheless, OSM also includes fundamental moderating and constraining factors that can positively or negatively influence the effectiveness of online design measures by companies. One of these factors is that for effective use of crossmodal correspondences, the consumer must have already experienced such a sensory (indirect) cue to be indirectly addressed through other senses that are not available, e.g., olfactory or gustatory (Elder et al., 2017). In other words, the consumer must have, for example, smelled a fresh sea breeze to ultimately be triggered through sensory imagination.

Furthermore, with regard to haptics, the need for touch (NFT) also plays an important role in OSM since not every consumer has the same desire to physically interact with the advertised product (Kühn et al., 2020a; Peck & Childers, 2003a). This also varies depending on the product type when it comes to search or experience goods (P. Huang et al., 2009). For instance, Weathers et al. (2007) demonstrated that sensory-rich web pages could have greater advantages for experience products, necessitating sensory information for evaluation.

Another moderating variable is brand trustworthiness (Schlosser et al., 2006), which can harm the OSM experience if it lacks. Strategies to enhance the OSM and to overcome these variables are described in the following sections in more depth.

4.1.2. Artificial Intelligence & Big Data

This subsection forms the understanding of the definitional and substantive foundations in the field of artificial intelligence and big data processing, as these subfields of computer science are crucial for conducting the research in section 5.2.

4.1.2.1. ***Convolutional Neural Networks***

The Machine learning is a subset of artificial intelligence in which a system solves a given task through autonomous learning, increasing its result accuracy with the provided dataset for learning. The fundamental principle is a multi-layered neural network inspired by biological processes (Haykin, 2009), which learns hierarchical structures in the data comparable to the human brain and is referred to as a Convolutional Neural Network (CNN) due to the method through which CNNs learn from the data (W. Wang & Gang, 2019). Neural networks were developed in the 1960s, but significant results were achieved starting from 2009 (Braka et al., 2020). Henceforth, additional levels were included, creating deep neural networks (Lecun et al., 2015) that enable valid results (Schmidhuber, 2015).

CNNs operate based on convolutions whose filters glide over the input space and compute dot products between the filter weights and local input patches aiming at decomposing a complex problem into several smaller subtasks that can be solved by specifically trained neural networks (LeCun et al., 1998; LeCun & Yoshua, 1995). In addition, pooling layers are applied to systematically shrink the feature maps generated by the convolutional layers, reducing spatial dimensions while preserving essential information (Zhiqiang & Jun, 2017).

In practice, artificial neural networks are used for both speech and image recognition. CNNs are primarily used for image classification, object recognition, and image segmentation (Sultana et al., 2020), hence being suitable for visual-related tasks. For text-related operations, recurrent neural networks (RNNs) like Long Short-Term Memory (LSTM) are appropriate (Greff et al., 2017; Schmidhuber & Hochreiter, 1997) in handling sequential data. Text-based tasks are, e.g., sentence classification (Socher et al., 2013) and sentiment analysis (Nowak et al., 2017; Tan et al., 2022). These methods will be used in this dissertation to analyze sensory data.

4.1.2.2. ***Natural Language Processing***

In both written and spoken forms, human language is the primary tool for exchanging information (Arbib, 2005). Natural Language Processing (NLP) is a multidisciplinary field that combines Deep Learning and Linguistics. It involves training computers through algorithms to understand human language and can be divided into five main research fields (Khurana et al., 2023):

- *Phonology* is the scientific study of the sounds in a language and its principles. It examines the combination and structure of sounds (called phonemes) in various languages.
- *Morphology*, on the other hand, deals with analyzing the structure and internal construction of words. It examines how words are formed and changed by combining morphological elements. This includes word stems, affixes, and inflectional forms.
- *Syntax* deals with the arrangement and structural organization of words in sentences. To form grammatically correct and meaningful expressions, words and sentence components are therefore checked with regard to their composition.
- *Semantics* analyses the meaning of words, sentences, or whole texts. The semantic focus in NLP is set on the meanings of certain word usages within languages and, thus, how they can be interpreted in different contexts, also referred to as polysemy (Alonso et al., 2011). The identification and resolution of possible word ambiguities is called *"Word Sense Disambiguation"* (Wimmer & Zhou, 2013, p. 1) and is crucial in NLP.
- *Pragmatics* aims to study the practical use and function of language in real social and communicative contexts. It bridges the gap between the content of textual elements and external influences, particularly the understanding of the reader and the communicative intentions of the text′s author. If there are interpretative differences, they are called pragmatic ambiguity (Walton, 1996). Accordingly, the pragmatic research field includes references, context dependency, speech acts,

and the influence of speakers' and listeners' knowledge and beliefs, which can differ among the individuals involved.

Within computer science, NLP is considered a subfield of Artificial Intelligence (AI) (Buchkremer, 2020; Dwivedi et al., 2021; Rodriguez et al., 2018). The fundamental challenge lies in the vastly different information processing between humans and machines. Human language is a highly complex system that has evolved over millennia and still constantly changes over time (Bates, 1995). It enables humans to engage in complex and detailed communication, involving not only the exchange of factual information but also a multitude of social and emotional aspects. In contrast, computers excel at processing simple information about binary states (0 or 1). Therefore, a bridge must be created between these two worlds to process natural language. Hence, the fundamental principle for processing text and speech data involves using mathematical and statistical techniques for data processing. Given the complexity, deep learning techniques play a significant role (Goodfellow et al., 2016; Gulli et al., 2019; Lecun et al., 2015). The advancements and subsequent boom in deep learning since the early 2010s have facilitated rapid progress in the field of NLP (Kamath et al., 2019). Although these successes have increased the importance of NLP, the discipline itself is much older, with essential foundations laid in previous decades. According to McCarthy et al. (2006), significant concepts for natural language processing were developed in the 1950s and 1960s (McCarthy et al., 2006; Ware, 1955). In the 1990s, additional components were created and are still used in NLP research and applications today. Furthermore, hardware advancements, such as increased speed and available memory, have enabled the practical application of NLP techniques (Kamath et al., 2019). Thus, NLP has continuously evolved (Khurana et al., 2023).

With the current state of technology, it is already possible to solve a variety of NLP-related tasks. This is particularly evident in using voice assistants or interactive and intelligent chatbots that can understand and generate syntactical language. Nevertheless, challenges still remain in accurately processing semantic aspects of language, such as emotions and ambiguity, but ongoing progress is being recognizable (Buchkremer, 2020), although ethical criteria within the wide range of AI should always be taken into account (Jobin et al., 2019).

4.1.2.3. ***Word Embeddings***

Word embeddings, a technique in the field of natural language processing (NLP), represent a form of application that contributes to text automation and interpretation (Lai et al., 2016). However, in the processing of text data by applying deep learning and machine learning techniques, the raw form of the texts is typically not utilized, and textual elements are considered discrete variables (McMahan & Rao, 2019). To apply mathematical and statistical methods to text data, it is necessary to represent them in a numerical form. The simplest form of such representation for texts and words is the one-hot encoding (Goldberg, 2016). In this method, words are represented as vectors, where the number of dimensions of the vector corresponds to the number of words present in the vocabulary (Kuang & Davison, 2020). Each word is represented by a single dimension, where the value is 1 for the dimension associated with the word and 0 for all other dimensions. This allows for the mathematical representation of different words. However, this form of representing text data has its limitations, as it only allows for the unambiguous identification of a word without providing any additional information. To overcome this limitation, word embeddings offer a suitable representation of text data. Word embedding refers to the process of embedding discrete variables into a vector space (McMahan & Rao, 2019). In this approach, each word is assigned a position in a multidimensional space, represented by an n-dimensional vector. Each vector dimension describes a specific property of the word´s meaning, semantics, or class (Kedia & Rasu, 2020).

There are several approaches to generating word embeddings, including count-based methods such as TF-IDF and methods that learn word embeddings directly (McMahan & Rao, 2019). Count-based methods such as TF-IDF apply to compute the relevance and importance of words within text documents based on a retrieved and pretrained text corpus (Kuang & Davison, 2020). It mathematically evaluates a word based on its frequency in a document (Term Frequency) and its rarity in the entire document collection (Inverse Document Frequency) (Ramos, 2003). Hence, TF-IDF supports identifying keywords in a text and compares documents based on their similarity in content (Ao et al., 2020). In count-based methods, a co-occurrence matrix is created to capture the frequency of co-occurrence of words. Each entry in the matrix indicates how often two words co-

occur in a given context (Lauren et al., 2017). To determine the word distances, each entry in the Co-Occurrence Matrix is weighted. It is important to note that a higher weight indicates a closer semantic relationship between words, while a lower weight indicates a weaker semantic context (Lauren et al., 2017). In addition, GloVe also employs a count-based approach and considers the global semantic similarities between different words by analyzing the co-occurrence patterns across the text corpus (Pennington et al., 2014; Yu et al., 2018).

On the other hand, methods such as Word2Vec take a direct learning approach for generating word embeddings. Word2Vec uses a prediction-based logic. The model learns to predict the context words based on a target word. Word2Vec is based on neural networks and utilizes a "Continuous Bag-of-Words" (CBOW) or "Skip-Gram" approach to capture words in a given context. Thereby, the CBOW model aims to predict a target word from its surrounding context (Mikolov et al., 2013), while in the Skip-Gram model, the goal is to predict the surrounding context from a target word (Sravani et al., 2018). The trained Word2Vec models capture relationships between words at a local level by grouping similar words in similar contexts (A. Y. Kim et al., 2018).

Moreover, representing words as vectors allows for calculating the relationship between two words. Similarity can be measured in two different ways. Firstly, it can be determined by the distance between two vectors in the vector space. Words with similar meanings will have vectors that are closer to each other compared to words with different meanings (Mitchell & Lapata, 2010). Derived from Euclidean geometry, this technique is also known as Euclidean distance (Ferrer i Cancho, 2004). Euclidean distance measures are interpreted in a way that the smaller the distance value, the closer the relationship between the two words. The second measure for determining the dependence among two word vectors is cosine similarity, which measures the relationship between two vectors in terms of direction and magnitude (Kedia & Rasu, 2020). The cosine similarity values range from -1 to 1 (Jin et al., 2018). A cosine similarity of 1 indicates that the two vectors are completely identical, while a value of -1 indicates that they are in opposite directions, representing a maximum difference and no semantic meaning (Lai et al., 2016). As a consequence, these learning-based approaches are applied in this dissertation in the DSR implementation phase (see section 5.2).

4.1.3. E-Commerce

E-commerce has become a widespread channel for companies and serves as a popular opportunity for selling products and services (Grewal et al., 2018). It is also referred to as electronic commerce and comprises online marketing as a sub-discipline of marketing science (Grandon & Pearson, 2004) that aims to effectively design web stores in an ever-growing digital competitive environment to convert website visitors into customers (Bleier et al., 2019; Schlosser et al., 2006). In this regard, a distinction can be made between companies that operate their own online shops and retail platforms, such as Amazon, eBay, Alibaba, and others. This dissertation focuses on the former, although the insights will be transferable.

One of the key e-commerce challenges is the presence of customers who are often unknown to the seller. However, anonymity on the Internet is countered by using cookies (J. S. Park & Sandhu, 2000), which store personalized user information. Cookies, fixed Internet addresses, and long-term user accounts with stored e-mail addresses also help to track customers. Through skillful use of technology, companies thus have the opportunity to turn an unknown customer into an almost transparent one whose preferences become increasingly known, even if he has to consent to the storage of this actively (Cahn et al., 2016). Similarly, e-commerce has advantages over traditional sales channels, offering greater supply flexibility and considerably lower transaction costs. These benefits, though, also contribute to lower customer loyalty as the comparability of sellers increases.

At e-commerce websites, products are displayed and offered to consumers mainly by incorporating textual and visual design elements (Bleier et al., 2019). However, when these components are combined, they foster multidimensional experiences that transcend the mere presentation of factual information (Brakus et al., 2009; Lemon & Verhoef, 2016). Nevertheless, the principal drawback for customers in e-commerce lies in their inability to physically inspect the products and the necessity to endure a waiting period for the ordered item, with uncertainty about the truthfulness and accuracy of its displayed representation (Dimoka et al., 2012; Hong & Pavlou, 2014; Y. Kim & Krishnan, 2015; Pavlou et al., 2007). This limitation could be addressed through the implementation of a multisensory consumer approach. Hence, the next section outlines the dimensions of the online consumer journey to underpin the importance of online sensory content.

4.1.4. Online Consumer Experience

According to Wolfinbarger and Gilly (2003) and Bleier et al. (2019), the importance of web design is constantly growing. Companies´ success in digital environments today depends on skillfully incorporating design elements on product websites to create engaging customer experiences. To create such a *"webmosphere"* (Petit et al., 2019, p. 42), Bleier et al. (2019) argue that four dimensions influence online purchasing. Even though previous research has primarily focused on the informational content of online consumer experiences (OCEs) and has thus simplified its modeling (Novak et al., 2000; Steenkamp & Geyskens, 2006), three additional dimensions can be routed to the OCE. These are consistent with the psychological and sociological research streams of cognition, affect, relationships, and sensations (Anderson, 1985; Pinker, 1997).

First, *Informativeness* (Luo, 2002) is the baseline and cognitive dimension that refers to functional and helpful information used to make predominantly conscious and problem-solving decisions (Gentile et al., 2007; Verhoef et al., 2009).

Beyond the functional dimension, *Entertainment* is another OCE dimension. Entertainment refers to the affective and immediate enjoyment that an online experience can provide without necessarily representing a functional benefit in the online purchasing process (Babin et al., 1994; Mathwick et al., 2001).

Next, *Social Presence* is another criterion for a successful OCE, as social interaction plays a significant role in shopping experiences (Gefen et al., 2003). Elements such as human contact, warmth, and sociability, which can be emulated on websites through suitable content (e.g., pictures, colors), determine this dimension (L. C. Wang et al., 2007).

The fourth and final dimension of the OCE is *Sensory Appeal* (Z. Jiang & Benbasat, 2007), which addresses how a website stimulates the human senses of touch, taste, smell, hearing, and sight (Gentile et al., 2007). As already outlined in section 1.3.3, sensory imagery can support the tangent of the indirectly responsive senses (Elder et al., 2017). Hence, this dimension represents the most crucial theoretical component of this dissertation. Sensory appeal, related to shopping experiences, is associated, among other things, with beauty and aesthetics, which are generated by corresponding sensory stimuli such as colors (Schmitt, 1999).

To examine the influence of the four dimensions on OCE, Bleier et al. (2019) adapted eleven different website elements. They also proposed a categorization and assigned these specific types of content to each category:

- *Verbal elements*, such as product detail descriptions, the general linguistic style used throughout the website, product features presented in bullet points, and return policy details.
- *Visual elements*, including lifestyle pictures, product detail pictures (referred to as feature crops), photo sizes, and product videos.
- *Verbal/visual elements* comprising expert endorsements, customer star ratings, comparison matrices, recommendation agents, and content filters.

These elements were manipulated and tested throughout 16 studies in an online setting. The results suggest that sensory appeal, particularly for experience products, is significant, as the product type (Hong & Pavlou, 2014; P. Huang et al., 2009), as well as brand trustworthiness (Pavlou et al., 2007), act as moderating factors related to uncertainty. In such cases, it is recommended to use visual elements that dynamically present the product, a finding consistent with Weather et al.´s (2007) previous research on the influence of sensory-designed websites. This means applying product videos with audio tracks (Moon, 2000; Roggeveen et al., 2015) and feature crop pictures that allow zooming in on product details (J. Park et al., 2005). Both sensory content types lead to a sensory-appealing website design, hence positively affecting purchase intentions (Schlosser, 2003).

Although Bleier et al. (2019) differentiate between the four dimensions, this work assumes that the design elements assigned to them can also have an overarching sensory purpose. For instance, the linguistic style could be seen from an overarching perspective, as textual information can convey sensory information and experiences (Bhatia et al., 2022; Ornati & Cantoni, 2020; Petit et al., 2019). Thus, in addition to product type, NFT is also a moderating effect that has not been considered so far (Løkke-Andersen et al., 2022). See 1.3.2 for a detailed overview.

4.1.5. User Experience

The concepts of usability and user experience (UX) are often used interchangeably in the field of human-computer interaction, but they have distinct meanings and emphasize different aspects of interactive systems (Battarbee & Koskinen, 2005). Usability, as defined by the ISO 9241-11 standard (1998), refers to the extent to which a product allows specific users to achieve specific goals effectively, efficiently, and with satisfaction in a particular context (Bevan et al., 2015; D. Green & Pearson, 2006). This definition emphasizes practical aspects such as effectiveness, efficiency, and user satisfaction in their interactions., which can be subsumed as the sum of hedonic and pragmatic quality (Hassenzahl, 2018). Usability ensures that a system is easy to learn, efficient to use, and error-free, enabling users to accomplish tasks effectively and satisfactorily. Early on, Agarwal and Meyer (2009) noted that in the course of usability, emotion also exerts an influence and is often overlooked. For this reason, emotion-related indicators can be found indirectly in newer measurement approaches, such as the UEQ measurement approach (Rauschenberger et al., 2013).

Contrastly, the ISO 9241-210 standard (2010) describes User Experience (UX) as the perceptions and responses that individuals have when using or anticipating the use of a product, system, or service. This definition highlights the holistic nature of UX (Battarbee & Koskinen, 2005), including the user's subjective perceptions, emotions, beliefs, and responses. User Experience goes beyond usability by considering factors such as aesthetics, emotions, pleasure, engagement, and the overall impression left by the system. Its focus is on creating a positive and engaging experience for the user, ensuring that the interaction is not only efficient but also enjoyable and satisfying (Hassenzahl et al., 2010).

As a consequence, usability and user experience are interconnected but have different scopes and emphases. Usability concentrates on the practical aspects of system interaction, ensuring effectiveness, efficiency, and user satisfaction. User Experience takes a broader perspective, considering the user's holistic experience, including their emotions, perceptions, and overall satisfaction. By addressing both usability and user experience, designers and researchers can create interactive systems that provide a satisfying and engaging experience for users by considering their evaluations at an early stage (Borsci et al., 2020).

4.2. ENVIRONMENT AND SCOPE OF THE DISSERTATION

Following the DSR alignment of this dissertation presented in section 3.1., the business need is to be identified by interviewing experts in the field of interest prior to developing an artifact that addresses this need. This section is designated to gain insights from experts in the online marketing domain, with the aim of answering RQ1. The RQ1 is related to asking if experts confirm a need for sensory evaluation in online domains, thus initiating the DSR process proposed by Hevner et al. (2004).

Within the scope of the subsequent semi-structured expert interviews, personal search behavior and awareness regarding sensory e-commerce content will also be investigated. This aims to confirm the DSR knowledge base grounded in relevant scholarly literature or expand it with additional information from the expert´s insights. Consequently, the interview approach addresses RQ4a, which inquires about how sensory elements impact e-commerce from both B2B and B2C perspectives and identifies the factors driving this influence.

4.2.1. Performing Expert Interviews (DSR Environment)

Conducting expert interviews is a fundamental aspect of this research, which aims to gain valuable insights into the need for sensory marketing assessments and individual online consumer journeys from different perspectives.

In qualitative empirical research, there are different approaches to questioning depending on the information desired (Flick, 2018, 2022). The basic form of structured inquiry is the interview, which involves direct interaction between the questioner and the respondent (Atteslander & Cromm, 2010). Semi-structured interviews (SSIs) are targeted, as are focus group discussions or surveys, but they hold the advantage that the questioner receives the researcher´s specific interest in obtaining information from the interviewee in the greatest possible depth and diversity (A. Adams & Cox, 2008). To ensure this via a systematic and rigorous approach, W.C. Adams' (2015) interview guide was used in this work. Adams developed a four-phase framework for conducting SSIs. This framework includes the selection and recruitment of interviewees, the formulation of questions and interview guidelines, interview techniques, and the final interview analysis applying the qualitative content analysis proposed by Mayring (2004).

With the insights obtained from the expert interviews, the DSR process is set in motion to be able to answer the following research questions (RQ2-7).

4.2.1.1. Planning of Semi-Structured Interviews

To acquire the derived research objectives, expert interviews should be properly planned before conducting, and *"preparation is vital"* (W. C. Adams, 2015, p. 502). Accordingly, semi-structured interviews need to be initially planned from an aerial perspective regarding its parameters, whereby structurally, temporally, and content-wise, all essential aspects are defined prior to execution (A. Adams & Cox, 2008).

Firstly, through *structural alignment and preparation* of the interview guide, it is ensured that the interview follows common techniques. For this reason, at the beginning of the SSIs, their stages are defined using the suggestions of Hove & Anda (2005). Table 4 illustrates nine steps on which the SSIs are grounded:

Table 4. Stages for Semi-Structured Expert Interviews

Stage	*Description*
Stage 1	*Clarifying the interview goals and determining the specific topics to be covered*
Stage 2	*Clarifying the interview goals and determining the topics to be investigated*
Stage 3	*Creating an interview partner pool from which suitable interviewees are selected*
Stage 4	*Initiating communication with the potential interviewees*
Stage 5	*Coordinating and scheduling a convenient time for conducting the SSI*
Stage 6	*Creating a tailored interview guide to ensure a semi-structured conversation*
Stage 7	*Conducting the interview remotely using virtual meeting tools*
Stage 8	*Documenting the interview details and key points in an interview transcription*
Stage 9	*Analyzing and interpreting the interview results with scientific techniques*

Author's elaboration, adapted from (Hove & Anda, 2005)

The individual stages outlined in Table 4 describe the adapted planning process of the SSIs specifically for this dissertation, forming the overall foundation for the chapter. Consequently, each step will be presented and discussed in detail in the respective subsequent sections of this DSR environmental phase.

A fundamental initial step is to determine the necessary number of interview participants to address the following interview questions. Various approaches exist with a common goal of achieving data saturation. For instance, Guest et al. (2006) suggest that typically, twelve participants are sufficient to achieve saturation of given answers on average. On the other hand, it is equally plausible to acquire fewer interview participants if saturation is observed for the given responses per interview question. Therefore, it is determined that potentially up to 12 interview participants (or more if necessary) will be interviewed for the SSIs to obtain optimal qualitative and content diversity in the responses. However, the author also follows the general recommendation to interview fewer participants if theoretical saturation is achieved earlier (Glaser & Strauss, 2010).

Next, to maintain the confidentiality of the given answers, especially with regard to business procedures, the participants in the interviews must be informed about the handling of their data prior to the first question being asked. This precautionary measure was taken to ensure that each participant is aware in advance of how their provided information will be treated during the interview process. In addition, it was pointed out at the beginning of the interview that the answers were anonymized and that a consent form for using the answers was provided afterward (see Appendix 2).

By opting for an online format (Stage seven), the interviewees were enabled to conveniently join the discussions from their own residences, thereby fostering a comfortable and familiar environment as proposed by W. C. Adams (2015).

In addition, time-related decisions must be taken. Maynatz et al. (2013) suggest that the length of an interview has a significant impact on how willing and motivated participants are to respond to the raised IQs. Accordingly, Atteslander and Cromm (2010) and Maynatz et al. (2013) generally recommend that a scientific interview should ideally range from 30 to 60 minutes. This timeframe ensures that sufficient information is provided for the dissertation´s scope of gathering answers to RQ1 and RQ4a while keeping participants engaged. The estimated time frame for the SSIs is about 35-40 minutes. Therefore, the stages necessary to properly plan the expert interviews are summarized in Table 5, which outlines the suggested schedule for each SSI conducted in this work derived from Hove and Anda (2005).

Table 5. Estimated Duration of Each Interview and Passage

Est. Time	*Description*
3 minutes	*Personal introduction and presentation of the research project*
1-2 minutes	*Providing information regarding data processing and data privacy procedures*
4-5 minutes	*Introduction of the interview participant, including job role, experience, and responsibilities*
25 minutes	*Asking interview questions (IQs) with the corresponding answers*
2 minutes	*Option for additional remarks by the interview participant*
2 minutes	*Conveying appreciation for the interviewee's participation and inquiring about their availability for another interview (DSR evaluation phase)*

The *content-wise* decisions being taken beforehand include that interview questions (IQs) are carefully prepared and formulated in advance, although the specific sequence and wording of the questions can be adjusted as needed. This flexibility allows the interviewer to shape the course of the interview based on the responses provided by the interview participants (Atteslander & Cromm, 2010). Consequently, the interviewer directly influences the flow of the conversation while not imposing any constraints on the answers given, thus avoiding limitations or biases in this study. Given that procedure, the interviewer can effectively obtain the necessary information from the participant by adapting to specific circumstances.

The framework of the SSIs is now defined by the content-related, temporal, and structural parameters described above so that the aspects of categorization, questions, interview recruitment, and analysis of the interviews will be dealt with in detail in the next subsections.

4.2.1.2. Description of the Categorization

Before commencing the expert questioning, it is necessary to establish the categorization of the interview questions. Two approaches, deductive and inductive categorization, are distinguished (Mayring, 2019). For the upcoming interviews, an inductive categorization system was predominantly chosen. Alternatively, a deductive approach could have been employed for all questions. This could involve presenting the interview partners with specific sensory consumer journeys in the digital context and seeking their evaluation, agreement, or disagreement. Theoretically, the specialist literature, as explained in Section I, would be sufficient for this purpose. However, the decision to favor an inductive category system is based on the aim of allowing interview partners to express their own search behavior independently. This approach intends to generate a broader range of answers than would be achievable through deductive categories alone. Hence, the interview guide is divided into two sub-areas described as follows:

- Topic 1: Online Sensory Marketing B2B and B2C perspective incl. own surfing behavior (RQ1 is answered here)
- Topic 2: Formal Criteria of Online Sensory Assessment Framework with questions on usability and design, information quality, and comparability possibilities in the competitive environment

The second topic presents subordinate categories derived deductively from common software developments. Although the scope of this work is not to create a fully developed software, the aim is to identify the requirements for such an assessment tool, incorporate them into a prototype (mock-up), and contribute to the creation of the final application. However, within these categories, the specific criteria mentioned by interview participants are determined inductively based on the assessment artifact to be developed. Through this approach, additional potential requirements for the artifact can be collected by having interview participants shift their focus from the applications they currently use in their daily work to the assessment proposal being developed. Ideally, any relevant best practices that could be adapted will be directly referenced. The detailed questions for both sub-areas are therefore provided below.

*4.2.1.3. **Semi-Structured Interview Questions***

The interview questions were organized in a coherent and relevant order. As is usual with SSIs, the order of the questions can be adapted and depends on the course of the interviews (W. C. Adams, 2015). However, the presentation of the interview results adheres to a predetermined order according to the final interview manual and is based on W.C. Adams' SSI guide (see section 3.4).

The interview initiates with a brief introduction elucidating the interview's purpose and basic information about data processing. Next, the interviewees are questioned about their professional background during the introduction phase. The main part of the interview focuses on Topic 1 and Topic 2 with open questions that reduce biases and increase answer diversity, as suggested by W.C. Adams (2015). The interview concludes with expressions of gratitude and further information concerning the dissertation's progress, ensuring that only relevant aspects for evaluating this work were gathered (W. C. Adams, 2015). Although Leech (2002) generally suggests that demographic information such as age, title, or background should be asked at the end of an interview due to potentially awkward considerations, he also points out that depending on the scope, it may be appropriate to start with such questions. This approach is being employed here because a significant portion of the interview involves eliciting the business need from the DSR environment. In this context, discussing the position within the company related to e-commerce or online marketing is suitable, followed by discussions on an assessment tool for sensory online marketing.

"When designing questions it is important to consider if each question will have the same meaning for everyone" (A. Adams & Cox, 2008, p. 19). Following Adams and Cox, a pretest with two individuals from the author's network was carried out to ensure comprehensibility and mitigate potential social biases. As a result, some wordings were aligned prior to the final investigation with experts in the field. Another aspect that was considered is that the interview guide should range from simple to more complex questions, according to Weinberg (1996) and Leech (2002).

Based on these structures, guidelines, and basic assumptions, the interview guide listed in detail in Appendix 1 consists of the introductory part (IQ1 & IQ2), the first main part on sensory online marketing (IQ3-IQ7), and the second main part on the targeted artifact, namely the formal criteria it should fulfill (IQ8-IQ10).

4.2.1.4. Recruiting Experts from DSR Environment

As mentioned earlier, the problem environment of the design-science-research approach used in this dissertation is situated in the context of online marketing and the professionals who work in it. Accordingly, many characters are potentially eligible to be interviewed because the online marketing field is highly diversified, and there is often a lack of standardized areas, job titles, and job descriptions. Accordingly, the following precise criteria must be applied in the recruiting process to determine if a person is an expert within the defined scope:

- At least one of the following keywords in the individual´s job title: E-commerce / online marketing / marketing / content.

  Note: Some job titles can exclude online-related keywords but still entail responsibilities for work in this field. Therefore, it is relatively broadly defined.
- Educational background in the online marketing discipline.
- Professional experience: at least five years.

In addition to the job title requirements, the academic background is also a criterion for participating in the interviews, as a marketing-specific educational background can be seen as an additional aspect of professionalism that translates into professional practice. The minimum requirement for professional experience is set at five years. While this may be relatively low, it ensures that participants have relevant professional experience in the broad field of online marketing. Furthermore, it is assumed that increasing professional experience does not necessarily generate added value for answering the questions. On the contrary, it is hypothesized that younger participants who have grown up with the internet, also referred to as *"digital natives"* (Bennett et al., 2008, p. 775), are most likely to be familiar with the digital sphere, both professionally and personally (Janschitz & Penker, 2022).

Emphasis is also placed on selecting interviewees with jobs that exhibit some level of diversification within the targeted perspective of the manifold marketing-related subcategories of employment. This allows for a bridge to be

formed with interview participants who are not solely responsible for online shop operations, i.e., onsite measures, but also individuals with responsibilities in the broader digital marketing domain, embracing offsite measures. Particularly in this context, traffic-generating strategies and assets need to be identified that establish a connection to chapter I, as consumer attention tends to be relatively lower, as well as their involvement and voluntary engagement with the product and brand content once consumers are already present on the website.

In this context, the interviewee's employer company size is only of secondary importance, as the intended artifact of this dissertation will not differentiate between them. Nevertheless, it is interesting to evaluate in which business settings the experts work to identify possible differences.

However, identifying experts in the relevant field poses a challenge, and this study relies on both predefined criteria, as described before, and self-evaluation by the participants. During the interviews, each participant was provided with a set of statements, allowing them to express their own rating of an expert status, and the responses given will be presented at the end of this section.

Finally, a total of eight online marketing experts were interviewed until the point of theoretical saturation was reached (Glaser & Strauss, 2010). The interview candidates were contacted beforehand via Linked-In and other social networks, as well as via the university platform. The interviewees' characteristics are presented in Table 6. Additionally, the following described demographic data, job positions, and responsibilities mentioned are summarized to the specific time when this dissertation was finished to retain the newest information of each interviewee. Characteristics of each interview participant are presented and discussed in this section due to their important role within this dissertation by contributing to two rounds of expert interviews, namely the DSR problem environment phase as well as the DSR evaluation phase. The first interviews aiming at the DSR problem phase were carried out in the first half of 2022.

The interview partners have been anonymized for data protection and signed the interview form shown in Appendix 2 for this purpose. Nevertheless, in the following, the suitability of the interview partners will be briefly described based on their respective working and educational backgrounds.

Table 6. Expert Interview-Pool Description

Participant	*Job Title*	*Working Experience*	*Last Degree*	*Industry*	*Gender*
1	*Content-Manager*	*8*	*B. Sc.*	*B2C (Media Agency)*	*Male*
2	*Team lead Product Management & E-Commerce*	*10*	*M. Sc.*	*B2C (Technology)*	*female*
3	*Online Marketing Manager*	*9*	*M. Sc.*	*B2B (Software)*	*female*
4	*Marketing Coordinator Central Europe*	*6*	*M. Sc.*	*B2B (IT-Services & Consulting)*	*Male*
5	*Creative // Art Director*	*7*	*B. Sc.*	*B2C (Fashion)*	*Male*
6	*Online Marketing Manager & Founder*	*7*	*B. Sc.*	*B2B (Power Supply) / Media Agency*	*Male*
7	*Online Marketing Manager*	*7*	*M. Sc.*	*B2C (Food)*	*Male*
8	*Associate Manager Online Shop Management & Brand Relations*	*6*	*M.A.*	*B2C (Fashion)*	*female*

- **Interview Partner | No. 1**

Interview Partner | No. 1 is a qualified Male serving as a Content Manager. With eight years of working experience and a bachelor's degree in marketing, he possesses a strong foundation in his field. His expertise lies in website conceptualization and applying software like Figma, with a specialization in agency work specifically tailored for Amazon. His primary focus is creating compelling content for Amazon Brand Stores. He can deliver tailor-made solutions that meet expectations by leveraging his creative abilities and deep comprehension of customer needs. The marketing-specific expertise of IP1 makes him an invaluable asset for gaining insights into online marketing content management strategies, particularly within the Amazon ecosystem.

- **Interview Partner | No. 2**

IP2 is a qualified female individual serving as a Team lead in Product Management and e-commerce. With ten years of working experience and a master's degree in marketing, she possesses a strong foundation in her field. Her master's thesis, *"The Importance of Haptic Elements on Digital Channels,"* (unpublished), focused on analyzing how haptic experiences can be effectively transmitted digitally and multisensory. In her most recent position, IP2 manages multiple websites and their content at a company specializing in re-commerce. The company markets technology products such as mobile phones, smartphones, tablets, and computers through its web shops, and IP2's team manages the online content for these platforms. Before her current role, IP2 was employed in the textile and fashion industry. Her responsibilities included website content creation, content management system adjustments, content and concept development, and social media management.

Her academic background and practical experience make IP2 a valuable resource for understanding product management, content creation, and e-commerce practices in both the re-commerce and fashion sectors.

- **Interview Partner | No. 3**

IP3 is an experienced female Online Marketing Manager. With nine years of working experience, she deeply understands the field. Her expertise encompasses various aspects of online marketing, social media marketing, search engine marketing, and blogging, primarily focused on Microsoft Dynamics 365 Business Central. Moreover, IP3 utilizes content management systems like WordPress and tools like Google Analytics, Google AdWords, and the Adobe Creative Suite. She is well-versed in website relaunches and digital transformation, applying her knowledge to enhance online presence and customer engagement. In addition to her primary responsibilities, IP3 also engages in side activities as a freelance writer, producing texts for e-commerce shops. This includes creating sensory descriptions for products and emphasizing her understanding of the importance of sensory marketing. Her academic achievements include a Master of Science in Marketing and Communications, with her thesis titled *"Multisensory Marketing for Digital Goods - An Empirical Analysis Using Software as an Example."* (unpublished).

IP3's experience in product management and e-commerce and her expertise in online marketing and sensory-based content creation makes her a valuable source of insights.

- **Interview Partner | No. 4**

IP4 is a male Marketing Coordinator. Holding a master's degree in marketing, he has a solid academic background. Previously, he served as an E-Commerce and Online Marketing Manager at a supply chain and logistics company and as a Sales and Marketing Assistant at one of Europe's largest fintech companies. In his current position, IP4 works for a provider of intelligent business networks that connect buyers and sellers for automated, compliant, and secure exchange of orders, invoices, payment instructions, and other business documents. Proficient in managing lead campaigns, utilizing marketing automation tools, and conducting comprehensive research, IP4 significantly contributes to the success of marketing initiatives.

Combining his academic knowledge with practical expertise, IP4 offers a deep understanding of marketing strategies, lead management, and data-driven decision-making. As a Marketing Coordinator, he navigates the complexities of the Central European market, ensuring the implementation of effective marketing campaigns and contributing to the organization's growth and achievements.

- **Interview Partner | No. 5**

IP5 is a male Creative and Art Director. With seven years of working experience and a bachelor's degree in marketing, he brings a deep foundation to his role. He began his professional career at a marketing agency as a media designer before transitioning to another agency, where he started as an Art Director. He then joined a fashion label that focuses on offering diverse fashion lines based on high quality. IP5 is responsible for designing the company's web shop at the fashion label, including creating and implementing marketing assets such as images, texts, and videos. He aims to ensure that the online shop is performant, utilizing targeted marketing strategies to improve the conversion rate. His combination of experience in the creative field and his understanding of marketing principles enables IP5 to

develop visually appealing and engaging marketing materials. By leveraging his skills and knowledge, he contributes to the success of the fashion label's webshop.

IP5 showcases his expertise in designing compelling marketing assets and his ability to contribute to the overall success of online marketing campaigns.

- **Interview Partner | No. 6**

IP6 is a male Online Marketing Manager with seven years of experience in the field. He holds a bachelor's degree in marketing and digital media, which has provided him with a solid academic foundation. IP6 worked as an Online Marketing Manager at a global energy company in his previous position. His responsibilities included providing different solutions in terms of online marketing initiatives.

In 2020, IP6 founded his marketing agency, focusing on serving small and medium-sized enterprises (SMEs). The agency initially specialized in building websites and providing digital solutions. However, in 2023, the agency was repositioned to focus on consulting services. IP6 has collaborated on numerous international projects, working closely with C-level executives of prominent corporations, start-up founders, government entities, universities, and SMEs. This diverse experience has allowed him to develop a deep understanding of different industries and their marketing needs. As a self-employed marketing and social media consultant, IP6 supports organizations to enhance their visibility and attractiveness to clients, customers, investors, and other stakeholders.

IP6's business role and his subsequent venture as a marketing consultant demonstrate his ability to navigate the dynamic digital landscape. Through his consulting services, he leverages his expertise to support organizations in achieving their marketing goals and establishing a strong online presence; thus, he has been chosen as an interview partner.

- **Interview Partner | No. 7**

IP7 is a male Senior Performance Marketing Manager at a prominent company in Germany that specializes in selling nutritional supplements for sports and well-being. The company operates three different brands, each targeting

consumers with specific interests, including athletic, vegan, and general healthy lifestyles. IP7 primarily focuses on offsite performance analytics of marketing campaigns, particularly regarding social media. Through his role, he has acquired extensive knowledge about the most effective marketing assets in the digital sphere. By leveraging his expertise, he maximizes the performance and impact of the company's marketing efforts. With seven years of working experience and a master's degree in marketing & communication, IP7 has a solid academic background and practical knowledge. In addition to his role at the company, he is self-employed and offers business consulting services, specializing in various online marketing-related issues.

Through his diverse experiences and comprehensive understanding of performance marketing, IP7 plays a vital role in driving the success of the company's marketing campaigns. His ability to analyze and optimize marketing assets, combined with his consulting expertise, enables him to provide valuable insights and guidance to SMEs, supporting their growth and success in the online market.

- **Interview Partner | No. 8**

IP8 is a female Associate Manager specializing in online shop management and brand relations. With six years of working experience, she brings valuable knowledge to her role. She holds a Master of Arts in marketing management and a bachelor's degree in media and business psychology. Throughout her career, IP8 has gained experience in various aspects of online marketing and content management. Additionally, she has diverse expertise in digital transformation. She has also worked in content and community management for one of the leading cosmetics brands globally. Currently, IP8 is employed at a well-known German fashion retailer. Her responsibilities encompass managing the online shop, ensuring its smooth operation and optimization. Furthermore, she has taken on an additional role in brand relations, where she fosters and maintains relationships with various brands associated with the retailer.

IP8's role as an Associate Manager showcases her multifaceted skill set in online shop management, content management, and brand relations. Her comprehensive understanding of marketing principles and ability to navigate the

dynamic digital landscape makes her a valuable asset in driving the retailer's success.

In addition to the brief vitae presented in this section, which the experts classify as such for this dissertation, each interviewee was asked to provide self-estimates based on the following expert statements:

- ES 1: I am a marketing expert.
- ES 2: I am a sensory marketing expert.
- ES 3: I am a web design / digital media expert.
- ES 4: I am an e-commerce expert.
- ES 5: I am a marketing analytics (SEO/SEA/Campaign Management, etc.) expert.

As shown in Table 7, the interview participants classified themselves within the field of marketing and e-commerce, as well as in the area of marketing analytics. A criterion is set that interview participants are only considered if they do not classify themselves as four or lower in any category. Consequently, all participants were considered experts, and their interviews were used for analysis. Additionally, the results reflect the desired diversity within the field of marketing, as the artifact is intended for practitioners who do not necessarily need to be experts in all areas but rather receive support through an online sensory marketing assessment tool.

Table 7. Expert´s Self-Assessment Related to DSR Problem Environment

Expertise Statement (ES)	*strongly agree*	*agree*	*neutral*	*disagree*	*strongly disagree*
Rating	*1*	*2*	*3*	*4*	*5*
ES1: I am a marketing expert	*IP2, IP4, IP7*	*IP1, IP3, IP5, IP6, IP8*			
ES 2: I am a sensory marketing expert	*IP1*	*IP2, IP4, IP8*	*IP3, IP5, IP6*	*IP7*	
ES3: I am a web design / digital media expert	*IP5*	*IP2, IP6, IP7*	*IP1, IP4, IP8*		
ES4: I am an e-commerce expert	*IP2, IP5, IP7*	*IP1, IP4, IP8*	*IP3, IP6*		
ES5: I am a marketing analytics (SEO/SEA/ campaign management) expert	*IP4, IP7*	*IP1, IP2, IP3, IP6, IP8*		*IP5*	
Note: Experts are defined as such if they do not rate themselves more than one time below neutral.					

*4.2.1.5. **Polishing the Interview Techniques***

In line with the SSI recommendations of W.C. Adams (2015), precautions were taken during the interviews to create a comfortable environment for the participants. Interviewees were informed that they were free to modify their answers or revisit previous questions at any time if needed. It was also emphasized that participants were not obligated to answer every question and had the option to skip or leave questions open. The interviewer adopted a passive role throughout the process. The author's participation in the interviews was limited to addressing

ambiguities, difficulties in understanding, or asking again for specific information in the direct context of the interview questions, following a dialogue in which, however, the interviewee has the main speaking part. Hence, the author's presence does not impose any limitations on the study.

*4.2.1.6. **Executing the Interviews***

The interviews were examined and recorded via Zoom as well as Microsoft Teams, depending on the individual choice of the interviewee, to ensure that each participant felt comfortable with the virtual environment throughout the interview. The interview appointments were scheduled according to the individual preferences of the interview participants. Following the interview strategy, the consent form for data usage (Appendix 2) was sent via email and signed by the interview participants. Thus, the interviews were transcribed and analyzed step-by-step. These eight interviews are transcripted in Appendix 11- Appendix 18.

4.2.2. Categorization and Coding of the Expert Interviews

Following the two defined Topics One, Online Sensory Marketing, and Topic 2, formal criteria for an assessment approach, the interview data collected was analyzed inductively using MAXQDA analysis software version 22. Initially, a category system was created based on the given answers to the two topics. This approach aimed to provide a more objective interpretation of the responses and facilitate their comparison that will be investigated later on, interview question for interview question. As a result, the following categories were derived through this inductive process and collected in Table 8:

Table 8. Categories Related to Topic 1 (Online Sensory Marketing)

Search Behavior	***Sensory Components***
On-site	*Overall Design*
Off-site	*Text*
Inspiration / Direct Search	*Pictures*
Involvement	*Videos*
Device (Website, App)	*Interactive Content*

The first topic, namely Online Sensory Marketing, was examined through interview questions IQ3 to IQ7. Initially, the experts were asked to describe their own search behavior in the field of e-commerce. Subsequently, the explicit understanding and significance of online sensory marketing were explored. This involved discussing which sensory elements in the digital domain the experts attributed importance to in their personal consumer journey, how significant they are, and ultimately, how they are perceived from a B2B perspective. The business need was also addressed, aiming to identify the DSR problem environment - a need for evaluating sensory online content.

As shown in Table 8, beneath the deductive categories of Search Behavior and sensory components, additional inductive chapters emerged. Regarding the experts' search behavior, a total of five inductive categories were identified. These include the sub-areas of Offsite and Onsite search behavior, as clear distinctions in search behavior patterns within these areas were observed. The majority of experts mentioned off-site search behavior, referring to the stage before reaching the e-commerce website, such as when users are still on platforms like Google. Another related but distinct category is the differentiation between direct search and inspirational search, as well as involvement. The final inductive category is the device used for conducting the search.

Furthermore, the second deductive sub-area of sensory components was explored through questions IQ3 to IQ7, focusing on their importance from both personal and business perspectives. Here, five inductive categories emerged. It starts with the overarching category of website design (UX), which can be further differentiated into the categories of sensory text, images, videos, and interactive elements (e.g., augmented reality).

For Topic 2, interview questions IQ8 to IQ10 were posed, aiming to investigate the deductive sub-areas of Usability, Information, and Comparability as core elements of the artifact. Table 9 illustrates the resulting inductive categories. Regarding Usability, three areas were repeatedly mentioned, contributing to the categories. This includes the emphasis on a simplified UX design. Additionally, a dashboard category was identified, which should be included in the assessment tool and present user-friendly information - either in a summarized or detailed view. Professional usage or login was also considered separately.

Table 9. Categories Related to Topic 2 (Formal Artifact Criteria)

Usability / Design	*Information*	*Comparability*
Ease of Use (UX-Design)	*Overall scores per sense*	*Comparability related to direct and indirect competition*
Dashboard	*Scores per individual indicator (text, image, etc.)*	*Comparability related to previous (own) results*
Log-in (professional usage)	*Specific recommendations based on analysis*	

The second criterion of Information can also be divided into three inductive criteria, some of which correspond to Usability. Simplicity of use includes the presence of an overall sensory score for the website, categorized by sensory modality. Furthermore, separate considerations of additional details are important, allowing individual users to focus on specific indicators (e.g., text or image materials). Lastly, recommendations provided by such an assessment tool following the analysis form the final sub-category.

In the third sub-area of Comparability, two inductive categories can be identified based on the analysis of the interview data. The experts primarily highlighted the importance of comparability within the industry and across industries. Additionally, a significant second category of comparability within one's own company was mentioned, based on product categories or previous results, enabling further historical comparisons.

4.2.3. Qualitative Content Analysis of the Results

This chapter now deals with deriving the previously listed inductive categories through a qualitative content analysis, according to Mayring (2004). As mentioned, a total of 18 inductive categories were determined based on the ten interview questions (IQ) for the two topics of interest. Specifically, the deductive categories were expanded to better capture the information obtained. Therefore, the analysis results per question are discussed in more detail below, beginning with the respective IQ.

Please note that the quotes and the timestamps from the individual interviewee's answers on IQ1-Q10 refer solely to the interviews conducted in the first round of interviews (DSR problem environment).

4.2.3.1. ***Topic 1 - Online Sensory Marketing***

The first topic strives to explore the expert´s knowledge and opinions regarding online sensory marketing by investigating given answers on IQ3 to IQ7.

4.2.3.1.1. Online Search Behavior

- **IQ3: How do you proceed when you shop online? (Search behavior, click behavior on the platform)**

When asked about their online search behavior and click behavior on shopping platforms, the eight interviewed experts provided various insights and perspectives. The analysis revealed six different aspects that were built as sub-categories, sorted from rather general to more specific issues as follows:

Inspiration Search vs. Direct Search was also mentioned as leading the online search behavior and needs to be separated. IP2 stated here that her search behavior depends on whether it is an inspiration search or a direct search. In the case of inspiration, she visits the landing page of the website, then possibly clicks on interesting banners and explores product details, including descriptions or images. IP6 shared a similar perspective, explaining that his search behavior differs when he has a specific product in mind versus just a product category. IP7 and IP8 also expressed the same thoughts, where they rely on category pages, filters, and search functions when browsing for specific products. In regard to direct searches, IP1 described his consumer journey even starting before reaching the e-commerce website, where he searches for detailed product information. IP6 also mentioned a comparable search behavior as his journey often begins directly on the website, making Google less important for him because he is generally predetermined in his search behavior.

Having arrived at the landing page on a webshop, the *Initial Website Visit and Overview* category was derived next. IP1 mentioned that he needs a good overview first when visiting the website and that too much content at this point causes frustration. IP2 supported this by stating, *"The experience is, of course, very crucial.*

That is, that the page is appealing" (IP3, 05:45). Thus, both emphasized the importance of a visually appealing website at the very beginning of the onsite shop experience.

Navigating being situated on the homepage leads to the *Importance of Search Functions, which* was raised several times. IP2 stated in this context that the search function is important, particularly for direct searches, as it enables quick access to desired products. IP5 agreed and mentioned that the intention with which one visits a website determines his search behavior, starting with the search bar. Related to that, IP7 and IP8 tend to directly explore categories, but they also seek inspiration on the homepages of their preferred shops through display ads. They mentioned a longer consumer journey as they seek inspiration, save items to their cart, contemplate their choices, and prioritize brand value over price. Brand importance was also highlighted by IP8. In contrast, IP6 tends to act rationally and swiftly, demonstrating the presence of different search behaviors in the pool of this work´s experts based on individual characteristics.

Another aspect being frequently mentioned by the experts was *Product Details and Descriptions*. In this regard, IP1 mentioned that he first looks for product details in the form of texts, pictures, and videos, among other things, when looking at the product detail page (PDP). IP3 and IP4 prefer initially focusing on product images to check if the product meets their expectations. Only then do they proceed to read descriptions. IP3 pointed out her descending priority within her search behavior, *"So, in the first instance, I look at reviews, then at pictures, then videos, and in the end, I would say on the text description"* (IP3, 03:08).

Lastly, less frequently mentioned was the sub-category of the *Content Beyond primary sensory content*. IP4 brought into account that, apart from sensory content, he also considers payment methods and return policies while searching for products in an online shop. IP2 considered prices here, too.

4.2.3.1.2. Comparable Sensations offline vs. online

- **IQ4: Do you think consumers can experience comparable sensory experiences in the online buying process (compared to offline)?**

Most of the responses to this question were very uniform. The individual statements can be found below, which did not lead to additional sub-categories.

IP1 confirmed that he believes that there can be comparable (although not directly identical) sensory experiences in e-commerce, although he points out the following here: *"Obviously [it is] difficult to get that exactly right, as it is possible offline"* (IP1, 12:40). IP6 agreed with the following statement: "*So experience on the same scale, of course not. That's, of course, also a bit of the dilemma where brick-and-mortar retail will still have advantages, even in the future. But there are many tools and mechanisms to get close to it."* (IP6, 08:05). IP3 and IP7 expressed a similar opinion, while IP7 emphasized, like IP6, that there are possibilities for compensation and mentions augmented reality, for example. Even more precisely, IP8 stressed that sensory appeal in the digital world is primarily limited to visual and auditory aspects, as these can be communicated directly. She also pointed out the possible challenges: "*I think there's a huge difference between going to a department store, looking at a product, trying it on, seeing how it looks on me. In the online store, I look at the photo and then have to decide, could this be something for me? Sometimes, depending on the photo quality, depending on the text info, I may not even know what the material is like and then ask myself, what am I getting myself into?"* (IP8, 09:51). But also, she commented that there is a lot one can do in this area (like IP6 stated as well), so, according to her, there is a range of possibilities to achieve sensory compensation in communication, mentioning the visual as particularly important.

These options were also explained in detail by the interview partners. IP3 highlighted that the visual aspect is very important for sensory compensation and that images and videos can be particularly supportive. She was also skeptical about using acoustics, such as background music on websites, even if it is technically possible. On the other hand, she rated sensory-formulated product descriptions as a possible further compensation possibility for the limited direct sensory address in the online area. Therefore, she concluded: *"I think you can do a lot indirectly, but I still think it's just never the same as offline."*(IP3, 05:06).

In this context, IP3 showcased another interesting aspect. She additionally pointed out that there are differences between offline and online in terms of sensory communication because offline companies can influence more from a retailer's perspective, such as the light and temperature of the POS, and online, it is often unknown where the website visitors actually are. Nevertheless, she said: *„But if you focus on the pure experience online, then I think you can control much more."*(IP3, 10:29).

By this, she meant, on the one hand, not knowing where the online customers are offline at the same time and whether they are in a pleasant or unpleasant situation there (perhaps on a crowded POS without air conditioning). This led her to assume that online companies can actively manage the overall user experience.

IP4 also confirmed IQ4 but again pointed out the aspect of trust in the webshop, as the online content, in particular, could be spruced up, as he described: *„This is always difficult online, where you simply have to trust that what you see, read or hear is realistically true."* (IP4, 15:58). In this context, he indicated the connection with sensory imagination and underlined the importance of memories of sensory experiences as described earlier in this dissertation (see section 1.3.3). He implied that if one has touched, seen, smelled, or experienced a comparable product in the offline world beforehand, transferring that experience to the online world becomes easier because one can empathize with the situation. IP4 explained that in the following way: "*You see or at least read the characteristics about the material, then you also know that it is comparable to what you may have recently had in your hand."*, (IP4, 18:09). IP5 shared the same perspective, even though neither of them directly uses the technical term "imagination" for this phenomenon. To foster sensory imagery, IP5 specified it with the fashion domain and suggested applying haptic keywords, such as soft, rough, fluffy, etc., or even 100% cotton (as IP7 stated), to convey references for the imagination process of the tactile quality of the garment.

Furthermore, similar to IP4 in the case of IQ3, IP5 mentioned free returns in this context to mitigate the limited possibility of sensory communication, hence increasing trust to overcome the online buying barrier for certain individuals.

Finally, IP6 introduced additional ideas aiming at *"simply convey emotions"* (IP6, 08:08) by mentioning new opportunities such as live-commerce, augmented reality, or just the deliberate color scheme of the shop.

4.2.3.1.3. Online Sensory Components

- **IQ5: Which sensory components in online shopping do you pay particular attention to?**

As expected, the experts addressed the various potentially sensorially associated online contents in response to interview question IQ5. The individual statements and frequencies of mentions are described below based on a descending

average significance of the online contents for the online purchasing process, based on the experts' statements.

Firstly, from a broader perspective, IP1 emphasized regarding this question, similar to IP6 in IQ4, that all sensory-related content should trigger emotions within the buying process, fostering comfortable situations – a criterion also raised by scientific literature and referred to as online atmosphere (Ha & Lennon, 2011). IP6 also highlighted UX design and the overall experience on the e-commerce website here, even though he did not explicitly refer to emotionality. Instead, he stressed sympathy when the online store is well presented. An additional underlying effect of this could be, as stated by IP4, the website´s flow, which is another criterion of UX design (Hausman & Siekpe, 2009). According to IP4, more in-depth, that happens subconsciously and, in his view, only becomes noticeable when the website does not run smoothly. In fact, both statements align with scientific findings related to creating effective online customer experiences (Bleier et al., 2019). Notably, in this regard, Apple's e-commerce website was named as a best practice by both IP1 and IP2. IP2 underscored the website design as particularly positive, conveying a comfortable feeling. IP1 delved into detail, highlighting the conveyed high value and quality through well-coordinated content that will be more elaborated now by discussing experts´ opinions on visual, textual, interactive, and auditory sensory content online.

The majority of the experts identified *visual content* as the most important sensory content area. However, further differentiation can be made within this category, according to the expert statements. Initially, *images* were predominantly identified as the most crucial sensory asset, and further categorization was suggested. According to IP1, in his view, images showing products in usage (e.g., a smartphone being held and operated) should be particularly showcased. IP7 and IP8 agreed with this perspective but added that in certain industries, such as the fashion industry, outfits are also of significant importance. This is because they facilitate both inspiration and visualization of how the garment can be combined with other fashion items. Accordingly, the underlying concept is the visual imagery effect (Elder & Krishna, 2010), even though it is not explicitly mentioned by name.

In addition to images showcasing product usage to make them appear livelier, the experts mentioned other forms of visual assets, such as *zoom-in pictures*

(IP3). IP4, in this regard, referred to comparable content such as so-called close-ups, which are large-scale close-up shots of the product, often depicted from different angles, aimed at promoting material and related quality assessments. Ultimately, both serve the same purpose, primarily focusing on (haptic) quality evaluation (Elder & Krishna, 2012; J. Park et al., 2005). In this respect, IP5 provided an even more precise example in the fashion sector, that the model should be presented in a kind of *"how it moves or interacts in a piece of clothing."* (IP5, 17:57). IP8 comprised on that point by describing in detail: "*Where I can see the model turning in a circle, for example, so that I can see the product from all sides."* (IP8, 12:16).

IP7 also noted *dimensional images* as an additional important visual format, specifically in his daily work in the dietary supplement industry. He outlined that many online shoppers struggle to visualize the size of capsules accurately, and such references could be crucial to avoid frustration, as also certified scientifically from a psychological perspective focusing on the need for touch prior to purchase (Peck & Childers, 2003a, 2003b), which was also explained earlier in section 1.3.2.

Furthermore, videos were mentioned several times as an important sensory trigger within the range of moving image content. IP2, IP3, IP5, and IP7 explicitly pointed out that (product-) videos convey the most content and are, therefore, particularly important. IP4 also emphasized the explicit trustworthiness of videos, as they are less manipulatable in his view, thereby increasing the desired trust in a web shop, even more so than with images. This implies a certain ascending value, although no other expert explicitly articulated it in such terms for IQ5. But similarly, IP5 sorted images, videos, and, finally, audio in descending importance. Regarding video content, IP3 concluded, however, that from her point of view, there is still a great need for videos to be implemented in the shop architecture as they are often linked externally (e.g., to YouTube). Interestingly, 3D content was not even mentioned by any of the experts as another onsite moving image asset.

Besides the visual sensory components, texts were also mentioned and dealt with as sensory online content. Referring specifically to textual content, IP1 stated that: *"Texts can definitely be important as well. Especially to reproduce the sense of smell and the sense of taste"* - [because] - *"if you manage to describe it reasonably, then of course that's the most important thing"* (IP1, 16:02). Please note that the last aspect of his statement refers once again to the sensory modalities in the webshop, which cannot

be directly experienced. In contrast, IP5 did not mention textual content, despite being involved in the fashion industry, in which haptic descriptions could be an option (Ornati & Cantoni, 2020). This underscores his own and his employer's priority regarding visual sensory assets. As a fashion online shopper, however, IP7 underlined that textual haptic descriptions of the fabric or the model´s fit also interest him. He accentuated: "*Because if it says 100% cotton, then I know what it is. Then I also know approximately how it feels.*" (IP7, 13:09). Although not explicitly stated, one can recognize a connection to scientific foundations in his statement, specifically a distinction between search and experience goods (Bleier et al., 2019).

IP2 and IP3 mentioned interactive content as another sensory content area, citing examples such as augmented reality (AR) in IKEA´s mobile application. IP5 also commented on this but emphasized that he believes it is still somewhat early from a more technical standpoint, and if implemented, it would be suitable as supplementary information material. Nevertheless, most of the other interviewees did not mention interactive content in IQ5.

As the final sensory content area, although it could potentially be addressed directly through videos or other files, audio content was considered, with only a few experts providing detailed comments on it. IP4 pointed out that he finds it annoying and, therefore, does not attribute significant importance to automatically playing audio when visiting a website. IP5 and IP7 shared a similar perspective.

4.2.3.1.4. Importance of Sensory-Content online vs. offline

- **IQ6: How important do you consider sensory content to be in the individual purchasing process (offline and online)?**

Please note that this question is independent of the experts' employers, and they should provide their reflections on IQ6 from their personal point of view.

When asked that specific question, experts raised interesting answers. IP1 stated that he believes that it is difficult to classify sensory content in this regard. He proposed that it depends on the product, indirectly addressing the concept of involvement. Furthermore, IP1 reiterated the importance of emotionality in the purchasing process (as he outlined in IQ3 and IQ4), which can be strengthened by sensorially optimized content and can have a significant impact. IP2 shared the same perspective. She suggested that when it comes to everyday essential

products, the sensory appeal is less relevant from her point of view. Instead, factors such as price and factual product information hold greater importance. Similarly, IP5 shared that viewpoint and described it as follows: *"I think somewhere in between because we also see in our current consumption that it works without haptic experience. But I think it could improve that significantly. So that's why I wouldn't say it's much more important or that it wouldn't be important at all. It's difficult to categorize."* (IP5, 13:52).

In contrast, IP3 differentiated between B2B and B2C, considering her professional experience. Regarding B2B, she viewed the subject as relatively less significant due to the presence of buying centers involving multiple individuals, where factors like prices and delivery times hold greater importance. Nevertheless, she acknowledged regarding B2C that: "*I can imagine that sensory experiences lead people to make non-rational decisions"* (IP3, 07:49). IP3's statement can be routed to emotionality and affective buying intentions of private individuals buying online, leading to attesting relatively high importance of sensory content.

IP4 was even more explicit in that respect, saying – as the only one of the interviewees: "*I would actually classify the sensory content even above that"* (IP4, 23:22). He justified his statement by explaining that he needs to be initially captivated by sensory elements on the web, including visual elements, to even consider other aspects such as price or delivery time displayed on an e-commerce website, that would otherwise not grab his attention.

IP6 also emphasized the importance of sensory elements due to the strong shift towards the digital world, where visual aspects, particularly, are gaining more prominence. In this context, he also mentioned the potential occurrence of sensory overload (see section 1.3.4).

Interestingly, in contrast to all the previous views, IP8 argued, albeit not explicitly, a sensory deprivation effect when a low value is set on sensory content. To illustrate this, she provided a drastic example: *"The one store that has no images probably won't sell as much as the one that has a lot of sensory elements."* (IP8, 14:33).

4.2.3.1.5. Need for Online Sensory Quality Assessments

- **IQ7: Do you think that there is a need to evaluate the sensory communication quality of your website?**

Regarding IQ7, all experts unanimously agreed that there is a need for measuring sensory content and, consequently, an assessment tool designated explicitly for online sensory marketing. However, they also noted that within the entrepreneurial context, such quality assessment currently does not fall under the term sensory marketing and is considered a distinct aspect. As IP1 stressed: *"It's definitely a topic, but it's not like you put a to-do list next to it and then work through every single point* [but] *"it certainly makes sense to take sensory issues into account"* (IP1, 19:20). However, he outlined the importance of keeping awareness around sensory communication in the background and questioning oneself, e.g., in relation to the specific product one is dealing with, especially concerning Amazon, which sets a restrictive framework that limits individual web design. IP2 argued similarly. She also did not currently associate it as a separate or directly addressed topic within her current employer's context. Nonetheless, she emphasized sensory marketing as an important criterion for the online shop. She subconsciously encountered this topic frequently in various work-related themes on a daily basis. For example, when e-commerce key performance indicators like website visits are high but conversions are low, one automatically considers not only the price as the primary indicator but also the quality of the presented content and whether the product is portrayed correctly. IP2 also explained that her employer, for instance, has not yet utilized images from a first-person perspective. However, IP5 highlighted that these images play a significant role in the fashion industry, enabling customers to visualize the clothing item being worn effectively.

IP5 further confirmed, based on his experience with a fashion employer, that online sensory marketing (OSM) is subconsciously important. He also mentioned the challenges of applying all sensory aspects manually across the entire fashion product portfolio due to its sheer size, as well as the limitations of customization that can only be achieved to a certain extent: *"But that's why I would say definitely [online sensory marketing] plays a role because you try it where you can. But it's just not one hundred percent in focus, I would argue."* (IP5, 16:19). Likewise, IP8 expressed that

OSM is definitely indirectly important and referred to her employer´s activities in the fashion industry, which is now increasingly pushing live shopping offers.

In the B2B sector where IP3 operates, sensory marketing seems to be not a primary focus. However, her employer recognizes the importance of presenting attractive mock-ups and designs, which may include software attributes like buttons that resemble machine knobs or other related elements. While it remains a subtle aspect in this particular context, IP3 acknowledged the relevance of sensory marketing in the business world in general and affirms the necessity of sensory marketing for her industry, even if the focus is currently still on SEO.

IP4 confirmed IP3's statement regarding the B2B sector in his current employment. However, based on his previous experience in a B2C company, he also affirms that sensory marketing is a component that is addressed, although not explicitly referred to by that specific term. He simultaneously highlighted the challenges faced when companies have large portfolios with similar or diverse products and limited staff to manage them – as mentioned by IP5 as well. He further elaborated on the added value of utilizing an assessment tool, as it would reduce the complexity of the topic for the individuals responsible. IP4 additionally drew a parallel with SEO/SEA, stating that marketing professionals often do not know every detail and rely on tools for support and optimization.

Regarding the potential of a sensory assessment tool, IP2 confirmed the limited resources within her department and proposed that such a tool could assist in working more efficiently. IP6 shared this view and stressed the usefulness of such an assessment tool, provided it works effectively. This statement aligns with several outlined that sensory marketing is intrinsically motivated and concludes from a heuristic perspective by adding: "*From my point of view, sensory communication is an issue in all marketing areas. It starts with the corporate design, that you have identical colors. That's the logo with which you want to transmit emotions to the customer. Perhaps there are also certain call-to-actions. This is generally the whole structure of marketing messages, which lives from emotions and sensory perception*" (IP6, 14:24). IP7 noted that, particularly in the area of branding, an essential factor is to convey the values of the brand using the tools available, such as colors, images, or a natural backdrop for natural-based food supplements, that he works on daily.

In summary, it can be stated that IQ7 is confirmed by the experts, even if the understanding of OSM in its specific form is not yet attested. IP8 also summarized well by claiming that an assessment tool is useful because "*otherwise the whole thing always remains a speculation and is based on what the competition is doing"* (IP8, 17:36).

4.2.3.2. ***Topic 2 – Formal Criteria of the Online Sensory Evaluation Framework***

After identifying a business need in the DSR environment, according to Hevner et al. (2004), three additional interview questions address the requirements for a sensory assessment tool in more depth.

4.2.3.2.1. Usability/Design

- **IQ8: In your opinion, what factors contribute to the practical usability of a designed framework?**

Concerning the usability of the planned artifact to meet the business need, there is a unified view among the experts from an overarching perspective. They agree that an assessment tool, regardless of its final design, must have an easy-to-use and efficient user interface. Both criteria are supported by specific aspects. IP7 highlighted the requirements for an indicator system and especially underlined the use of exclamation marks. IP7 underlined that a visually clear tool would be a great help in the daily complex work. For example, visual effects such as several exclamation marks could indicate a yellow light in the sensory content area, while more exclamation marks could turn this area red.

IP5 also stressed the importance of the assessment tool being highly interactive and intuitive. He suggested connecting with external tools or platforms such as Shopify to increase productivity. In addition, IP5 mentioned the need for internal connectivity between teams, allowing multiple departments to access analytics results. As an illustration, he noted customer service and the handling of customer complaints or issues with unmet expectations: *"Especially with regard to a customer complaint, for example, it would be interesting to find out what triggered it. So, was it bad pictures, was the website "too loud"? If I integrate videos there, for example. So, it would also be interesting to know which sensors triggered a complaint or the purchase in the other case."* (IP5, 23:31). IP7 also highlighted that the tool should be as *"simply as possible"* (IP7, 29:58) because he could simplify communication between the

departments since he does not design the online content such as texts and images himself. Alternatively, he could present the artifact to the creative department and demonstrate how the online assets should appear. In doing so, he could provide a more comprehensive and supported briefing by utilizing the assessment tool.

From a purely technical perspective, IP2 further proposed that the artifact should function like a crawler. She described the functionality as follows: "*It should collect all the data and then evaluate at different points how good the multisensory communication is"* (IP2, 24:01).

Additionally, IP3 stated that having a search slot embedded on top of a separate tool webpage would be advantageous. Alternatively, both IP1 and IP3 suggested that the artifact could function as a plugin, which online marketing managers could implement in their preferred browser. This way, they could receive prompts directly on the analyzed page at relevant locations.

4.2.3.2.2. Information Quality

- **IQ9: What specific information would you expect the framework to present regarding online sensory marketing assessments?**

Regarding the presentation of information within the artifact, there were quite similar views and ideas among the experts.

Firstly, it is suggested that there could be different levels of information tailored to the needs and potential users. For example, IP1 proposed a sensory overall score that is displayed upon opening the program after analyzing the desired URL or e-commerce website. This score would include basic characteristics of the website, ratings in sensory sub-areas, and a ranking to assess how the website performs sensory-wise in the relevant competition. Alongside IP1, IP2, IP6, and IP7 also mentioned the importance of providing such an initial overview of the data, supporting the concept of a sensory dashboard. Similarly, IP6 recommended two versions of sensory analysis output: "*One for people who can perhaps see five scores at a glance in a dashboard, so that you can see directly what you can work on"* - for the operational level, which involves working with detailed results and potentially implementing new sensory online content, he emphasized at the same time: *"I believe that it is simply very important in terms of user experience that the data is prepared as easily and user-friendly as possible"* (IP6, 23:56). Additionally, IP6 stated that the

sensory information provided should not be overly complex, aligning with previous statements from other experts regarding usability (see section 4.2.3.2.1).

As a second level of information, in particular for the operational level, IP1 imagines: *"You can click either further down or directly on the respective sense and then perhaps learn a bit more explicitly* (00:28:38). It was therefore suggested that an artifact for sensory measurement of online content should also provide detailed analysis in addition to the dashboard and highlight areas for improvement. IP1 elaborated on this concept and explained: "*In this area, one would then really explicitly learn the individual ratings for it, perhaps also that individual images, videos, or texts are dealt with there."*(IP1, 25:24).

Furthermore, IP3, IP5, IP7, and IP8 emphasized the significance of delineating the performance levels of sensory implementation on the website. They suggested that this evaluation should ideally be conveyed through visual cues such as color highlighting (specifically mentioned by IP7). By employing a color-coded system, the tool could effectively communicate the extent to which sensory elements are successfully integrated, as well as identify areas with potential for sensory communication improvement. This approach enables users to discern the strengths and weaknesses of the sensory aspects of the analyzed website, fostering informed decision-making. Considering this point, IP2 stressed the need to point out when something is meaningful, not only in terms of sensory measurement separately but also in the context of the website or industry. This implies the need for weighting or prioritizing certain aspects, as mentioned by IP1 and IP4. Thus, IP4 stated that the prioritization of identified optimization potential is crucial and should be made explicit. This includes distinguishing between what must be addressed and what could be addressed. Furthermore, he outlined that the tool could provide an indication of the estimated time or effort required for each sensory optimization potential, such as categorizing them as short or long-term content projects.

IP8 proposed another specific suggestion about the information structure for the detailed section: "*Separate visual and auditory content, for example. And then again, especially if you start from visual content, differentiate between image, text, and video. Exactly. So that's how I would suggest it.*" (IP8, 23:29).

At this detailed level, IP2 (like IP8) suggested implementing a heatmap to enhance the clarity of optimization potentials on the analyzed e-commerce website. Additionally, IP2 mentioned favorable similarities with Google Ads, where the sensory analysis tool could not only identify improvement opportunities but also potentially automate their implementation. It is important to note, however, that this falls clearly beyond the scope of the dissertation, and optimization recommendations always require human intervention. While computer-assisted optimization may be possible, the automation of this process contradicts the overarching research question and is not intended in this dissertation.

However, IP3 presented a different approach by stating that while the tool identifies potentials, the company can decide whether to carry out sensory optimizations in-house or explore partner offerings that can be integrated into the tool. For example, utilizing agencies to leverage the potential and overcome any internal limitations regarding personnel or expertise. IP3 elucidated that *„there is certainly still a great need for people to be trained and to know what to do."* (IP3, 13:59.) Similarly, IP4 believed that content managers might still lack awareness of this aspect. He outlined this in the same vein, highlighting that *"[…] emphasis on improving it, because the content managers, for example, just don't have it in front of their eyes."* (IP4, 29:03) – and from his point of view, this is precisely why a sensory assessment tool would be advantageous. IP5 further elaborates on this point and suggests A/B testing tailored to the specific sensory content area to determine which assets work the best.

Another information quality-related criterion could be, as IP2 and IP8 outlined, that the artifact allows for internal comparisons between sensory communication quality for the product portfolio. Since the content can vary depending on the content page (e.g., homepage, product detail page), including its (sensory) communication quality and quantity. In this context, the concept of authenticity arises, as the consistency of assets across subpages could be incorporated into the evaluation or indicated by the artifact to be designed.

Finally, as suggested by IP3, it is proposed to offer a standard and a premium version of the tool. This differentiation would allow users to access historical data to compare their own performance and benchmark against relevant competitors.

4.2.3.2.3. Comparability

- **IQ10: How do you rate the importance of competitor information?**

In response to the final question of the first interview round, all experts concurred that incorporating information about relevant competition into the assessment tool is crucial and serves as an additional significant aspect of its utility. However, individual interviewees emphasized different elements in this regard.

IP1 raised the aspect that it depends on which brands you choose to compare yourself with, or specifically, with the most significant player in the industry. He also drew attention to a possible feature of self-selecting the websites to be compared – be it inside or outside the related industry.

In addition to IP1, IP2 has also confirmed that they generally pay close attention to competition in terms of content and already utilize tools for this purpose. According to IP1, competitors are also unconsciously screened in terms of sensory marketing, for example, in how they use images in a vibrant, emotional form. IP8 also highlighted the particular significance of competition in the context of the fashion industry where she works. IP5 agreed on that, especially when exploring innovative ways to convey a garment's tactile experience effectively.

Next to these statements, IP4 stated that it is always important to see how the relevant competition is performing in terms of online content and relevant key performance indicators (e.g., conversion). He mentioned that a practical integration from his point of view would be a benchmarking, which compares the sensory communication of the key market players within the industry to one's own sensory results/scores. Instead of using the term benchmarking, IP6 referred to it as references, while IP7 described it as best practices. However, both terms can be attributed to the context of benchmarking.

Based on the previously expressed opinions from the experts, IP2 elaborated, emphasizing particularly: *"I wouldn't consider it just a "nice-to-have" to be able to see the comparison. It depends, of course, on what the tool is ultimately capable of and whether the analysis is done automatically for all competitors or for some competitors"* (IP2, 32:21).

As a further and final aspect, IP6 additionally imagined: *What I wouldn't find bad either would be concrete video instructions or support that can explain to the users step by step how to implement or solve the problem areas.* (IP2, 26:48).

4.2.4. Discussion

The semi-structured interviews (SSIs) conducted in this chapter have yielded several essential findings that are of significant importance for the progression of this research. The overarching goals of the SSIs, pertaining to the main deductive categories of online sensory marketing, were to gather detailed insights into online search behavior from both personal and professional perspectives and to question the significance of sensory online content based on expert opinions. The experts predominantly emphasized the visual aspect, along with textual content and interactive sensory elements on websites. Sensory text was considered less relevant by the experts. However, some scientific sources highlight the use of text as descriptive sensory triggers, suggesting that this kind of content should be further explored and integrated into the AI analysis methods.

In this regard, the purpose of conducting the SSIs primarily revolved around confirming a business need or problem. This confirmation was unanimously provided by all experts, establishing the DSR problem environment as confirmed and subsequently allowing the detailed progression of the actual design process, as per Hevner's framework (see section 3.1). It was also necessary to collect the experts' opinions and ideas regarding the artifact to be developed, as they are potential users of a framework or tool for capturing sensory online content. Therefore, Topic 2 - the formal requirements of the artifact - focused on determining the specific demands that need to be met. These demands were categorized into usability, the information content of the sensory analysis, and comparability with competitors. The detailed insights obtained will be considered and implemented in developing a prototype in section 5.3.

Prior to that, a systematic literature review was conducted in the next section to examine existing research gaps in the broad field of sensory marketing.

4.3. SYSTEMATIC LITERATURE REVIEW

Authors are required to provide a rationale for the necessity of an independent literature review (Kitchenham & Charters, 2007). As described and revealed previously, this dissertation asserted the existence of a problem environment in the field of DSR, specifically highlighting the need for sensory measurement in the e-commerce business (RQ1). This confirmation underscores the importance of conducting a systematic literature review (SLR) as an essential and foundational step in initiating a research endeavor (Baker, 2000).

The scientific interest and relevance of SLRs in research were acknowledged by many researchers (e.g., Cooper, 1988; Webster & Watson, 2002) as an essential initial task and fundamental basis for any scientific research project. Conducting a literature review serves the purpose of identifying and examining existing research sources relevant to the research problem, ensuring the scientific rigor and relevance of this dissertation (Bandara et al., 2015). Furthermore, avoiding redundancies in existing scientific contributions is supported. In this dissertation, the literature review is performed applying vom Brocke et al.´s (2009) framework as described in section 3.3 to ensure rigor in the subsequent SLR.

The subsequent phase of the investigation involves conducting an SLR to locate and examine scientific studies related to the identified research context and discuss how it fits the dissertation´s scope. Therefore, the RQs from section 2.2.2 will be answered within this chapter. The first research question seeks to identify and examine the existence of relevant theories, findings, and assessment concepts related to sensory marketing that can potentially enhance the sensory experience of online consumers (RQ2a). Additionally, the SLR will also explore scientific work to uncover if approaches that integrate sensory marketing with artificial intelligence exist and investigate their purposes (RQ2b). RQ2c addresses the aspect of whether any relevant approaches combining sensory marketing, artificial intelligence, and automation exist, particularly those that aim to develop an automatic assessment framework for sensory marketing e-commerce content.

Consequently, to investigate the three RQs, this section also deals with three directly derived hypotheses, namely a concept hypothesis (H1a), a temporal hypothesis (H1a), and a methodological hypothesis (H1c), that are defined below:

H1a: A substantial body of relevant sensory marketing theories and findings exists to enhance the online sensory consumer experience.

H1b: Scientific research on sensory marketing has consistently grown over the past 20 years, with a rising focus on artificial intelligence implementation.

H1c: There is a lack of identifiable articles that specifically examine the assessment of sensory e-commerce elements from a methodological perspective.

H1a is related to a conceptual analysis to gain insights about different research streams that possibly affect online sensory marketing. H1b builds on the previous hypothesis and asserts that the identified scientific domains of sensory marketing have exhibited consistent growth in recent years. H1c states the absence of an assessment approach for online sensory marketing-related content by investigating the retrieved literature from a methodological perspective. This includes the search for manual and automatic procedures equally.

Accordingly, the following sections elaborate on the execution of the literature review process and highlight each operation undertaken as presented in the material and methods chapter (III), ensuring that the SLR follows common research practice (Burggräf et al., 2020) supported by new computer-assisted methods like STIRL.

4.3.1. Literature Grouping based on STIRL-Approach

To analyze substantial amounts of scientific literature, a dual search and review strategy, as proposed by Buchkremer et al. (2019), was implemented as a suitable methodology in scientific reviews. Consequently, an initial step involved the application of the AI-based systematic taxonomy for information retrieval from literature (STIRL). This approach facilitates a methodical investigation of literature by utilizing machine learning techniques. Buchkremer et al. (2019) have developed an approach that effectively supports machine learning, making it highly applicable to current research endeavors by enabling the automated analysis of extensive volumes of literature, free from (human) errors. Hence, it supports increasing the efficiency of conducting a holistic SLR. Following the principles of

the STIRL approach, the author initially defined topic-specific search strings, which were employed in scientific online databases.

Firstly, the author of this dissertation elaborated scientific online databases as appropriate data sources for literature retrieval that have been active and established in the market for a long time (at least ten years), thereby also being consistently maintained. Hence, established and human-based managed scientific databases are superior and to be selected instead of algorithm-only-based databases like Google Scholar when search results are wanted to be of high quality only (Brophy & Bawden, 2005; Gusenbauer & Haddaway, 2020). Google Scholar, for instance, still indicates that it misses some essential scientific papers and entails a vast amount of not formally published papers, also known as grey literature (Haddaway et al., 2015; Halevi et al., 2017). Therefore, the following databases for scientific literature were selected:

(a) Web of Science (WOS), (b) SAGE, (c) Institute of Electrical and Electronics Engineers (IEEE), (d) Springer Link, (e) ScienceDirect, (f) Wiley.

The aim of crawling these databases was to focus solely on peer-reviewed articles that were obtained and added to the retrieved research corpus (Rowley & Slack, 2004; vom Brocke et al., 2015), which is intended to serve for *"testing linguistic hypotheses"* (Khurana et al., 2023, p. 3730). Table 10 below refers to the search methodology and compresses the article retrieval phase and its results. To gather the below literature results, Table 10 also includes the column titled "Search Term," which indicates the specific term utilized for querying each database as a foundation for the search. The Boolean operators "OR" and "AND" were employed to refine the search parameters. For instance, "OR" denotes an inclusive condition where results containing either one or both search terms are retrieved. Despite that, the Operator "AND" signifies that the search must yield results containing both specified terms, such as sensory marketing and big data. The "Search field" columns clarify the specific sections of a document where the search query was applied, and the " Supplemental criteria" column lists the desired document type that should be obtained from each scientific online database. The utilization of phrase operators (Buchkremer, 2020) further facilitated the retrieval of desired word combinations in the exact sequence within the search results (e.g., "sensory marketing").

Table 10. Search Methodology for STIRL Systematic Literature Review

	Web of Science (WOS)	***SAGE***	***IEEE***	***Springer Link***	***Science Direct (SD)***	***Wiley***
Search Term I	*"Sensory Marketing" (E-commerce OR Digital OR Digitization)*					
HITS	*21*	*44*	*1*	*62*	*70*	*44*
Search Term II	*"Sensory Marketing" AND (Measur* OR Evaluat*)*				*"Sensory Marketing" AND (Measurement OR Evaluation)*	
HITS	*74*	*56*	*1*	*114*	*159*	*81*
Search Term III	*"Sensory Marketing" AND ("big data" OR "artificial Intelligence" OR "deep learning")*					
HITS	*5*	*24*	*0*	*0*	*34*	*21*
Search Field I	*Publication Title*					
Search Field II	*Abstract*					
Supplemental criteria	*Articles, Proceeding Papers, Review Articles*	*Research Articles, Review Articles*	*Journals, Conferences*	*Article, Conferences*	*Research Articles, Review Articles*	*Journals*
HITS TOTAL	*100*	*124*	*2*	*176*	*263*	*146*

Otherwise, an automatic placement of the AND operator between the two terms would occur, potentially resulting in fewer relevant search hits. Ultimately, a search hit must theoretically include both words; however, they may be separated by such a distance that the intended relevance to the search topic is missed—for example, when "sensory" appears as a term on the first page of the document and "marketing" appears on the last page of a document.

According to Torraco (2005) and vom Brocke et al. (2009), the search phase requires a balance between narrowness and tightness to define the scope in which additional knowledge should be collected and analyzed. Therefore, as described in

section 3.2, Buchkremer et al. (2019) stress avoiding abbreviations that could cause a failure to identify the relevant literature of interest for an SLR. Consequently, this possible limitation was considered during the setup of the three search strings used in this dissertation´s SLR, resulting in the avoidance of any abbreviation.

Definitions that are not well established in the scientific community could cause the same inconsistency in relation to the intended development of the body of literature. However, in the present case of the dissertation, this potential for error can be ruled out as there are no conflicting definitions or terminologies specific to the intersection between sensory marketing as a niche and the general marketing discipline. The theoretical foundations of sensory marketing explained in section 1.3 are therefore neither included in the search string as separate search terms nor considered as synonyms. The underlying assumption is that multisensory enhancement, need for touch, sensory imagination, sensory overload, and sensory deprivation serve as the basis for the understanding of today's sensory marketing discipline (Elder & Krishna, 2022; Krishna, 2012) and are, therefore included in the literature results anyway, without filtering them too coarsely.

Contrastingly, in scholarly discourse, the hyphenated form "e-commerce" is widely acknowledged as the preferred spelling. This convention adheres to established linguistic norms, reflecting a more formal and academic approach. However, it is essential to note that the unhyphenated form "ecommerce" is also prevalent in informal contexts and domain names. Nevertheless, it was tested before running the retrieval process to see if there might be a significant impact on including or excluding one of the spellings, and it could be identified that the results were neither positively nor negatively affected.

In addition, there were formulations or synonyms that were adapted for the intended context between sensory marketing and e-commerce. The term "e-commerce" was therefore enriched through broader keywords like "digital" and "digitization," which complement the following search term I:

"Sensory Marketing" (E-commerce OR Digital OR Digitization)

Another crucial criterion in the scope of this SLR is to obtain if measurement approaches regarding sensory marketing already exist. To investigate this aspect,

a second search term was formed that includes the concepts "measurement" and "evaluation" to capture sensory assessment methods. In contrast to the initial search term I, the scope of the literature search may be too limited if the aforementioned concepts were directly used without modification in the search query. Consequently, it is advisable to utilize wildcard characters, which are supported by certain scientific databases. Wildcards are special characters that enable the search for zero, one, or multiple characters. The precise placement of the wildcard character is significant, whether it is positioned before, within the middle, or after the specific word being sought, allowing for the inclusion of additional characters. For instance, if the keyword "measur*" is to be included, the database crawler would not only retrieve articles containing the exact term "measure" but also those containing related variations like "measuring," "measurement," or "measurable." Whenever the wildcard search functionality was available, it was utilized accordingly via the truncation operator "*" (Buchkremer, 2020). Thus, the second search term employed was set up as follows:

"Sensory Marketing" AND (Measur OR Evaluat*)*

Wildcards were not supported at the time of this investigation by the platforms ScienceDirect and Wiley, causing to replace the original root forms of words from search term II with their derived formulations.

To complement the SLR, a third search term was designed to capture scientific articles that deal with the last criterion of the dissertation´s proposed research gap (see section 2.1), namely the combination of sensory marketing and artificial intelligence (AI). AI as an abbreviation was excluded from search term III. Otherwise, too many out-of-scope search hits would have appeared. In addition, it can be assumed that scientific articles write out the abbreviation at least once in the entire document. As an alternative approach, the literature search incorporated closely related terms to AI. Some of these terms are used interchangeably in scientific sources. Therefore, the terms "big data" and "deep learning" are included using the OR operator to obtain a comparatively wide range of relevant literature in this specific subarea by search term III, which was defined as:

"Sensory Marketing" AND ("Big Data" OR "Artificial Intelligence" OR "Deep Learning")

The final literature retrieval with the presented three search terms was subsequently done based on the titles and abstracts of the scientific articles. Focusing on these two attributes ensured that only contributions encompassing the previously defined sensory, assessment, and AI-related keywords were identified. After executing the search, the exported information encompassed a total of 811 peer-reviewed scientific papers. As different databases were applied, a first check for duplicates (Higgins & Green, 2008) was used to build the final literature corpus, which consisted of 429 remaining unique articles.

To apply the STIRL process proposed by Buchkremer et al. (2019) to this literature corpus, the initial step involved utilizing the Python-based Natural Language Toolkit (NLTK) (Bird et al., 2009) to execute stemming to the text data within the corpus. Stemming proceeded based on Porter´s (2001) snowball algorithm that allows tracing back the words to their root forms (see section 3.2). Furthermore, following the NLTK procedures, stop words were removed from the literature corpus. In addition to the standard stop words provided by NLTK, for instance, "the," "an," "a," "and," "by," "is," and "of," an additional specific set of stop words was generated and excluded. All applied stop words during the analysis procedure were finally:

service, serving, servic, system, use, provide, de, la, wine, factor, activ, articl, high, show, play, propose, base, scheme, paper, solution, sevice, integer, bases, user, student, work, firm, result, results, review, research, studi, study, focus.

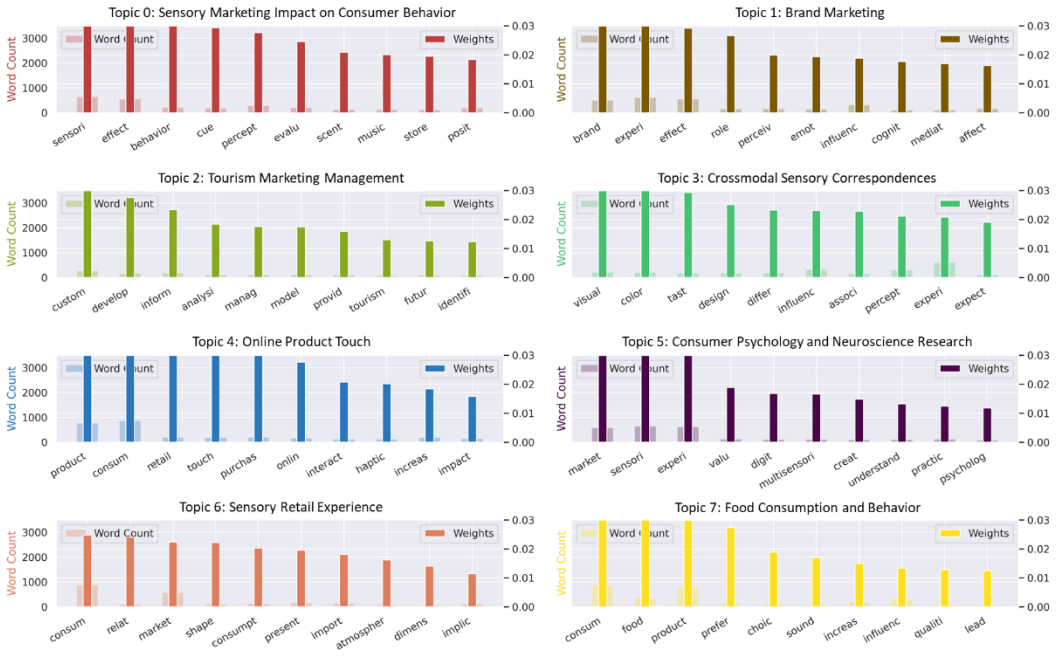
The above-listed stop words were presented and applied in their stem form, as stemming was performed prior to their removal from the literature corpus. This methodology reduces the necessity of providing a larger set of stop words, as only the root form of the targeted word is required for removal.

Next, as described in section 3.2, the preprocessed literature corpus underwent Latent Dirichlet Allocation (LDA) analysis to identify random word

combinations and generate suitable groupings based on the retrieved literature (Kontostathis et al., 2004). Therefore, LDA utilizes the likelihood of each data point aligning with a distinct value representing diverse data groups. In particular, LDA generates random combinations of words from the literature corpus (Blei et al., 2002). Following that, the LDA procedure computes the likelihood of individual scientific articles within the literature corpus matching the random word combinations, assuming the potential assignment of words to multiple groups simultaneously (Rüdiger et al., 2022). The number of word groups and their respective combinations are then employed to allocate the papers stored in the literature corpus based on the likelihood of their belonging to a specific LDA-based group. Prior research on topic modeling already revealed strong correlations between identified topics and the way humans comprehend these texts (Blei, 2012).

Eight trending topics and their respective word counts could be identified based on the three search terms, as illustrated in Figure 7. The distribution of document lengths used to create the topics needs to be examined to assess the validity of the generated topics. Therefore, Figure 8 additionally displays the statistical distribution of words within each identified topic. The distribution of the eight topics nearly aligns with a normal pattern, suggesting that the length of documents approximately follows a Gaussian distribution (N. R. Goodman, 1963).

Figure 7. Word Groupings Identified by applied LDA

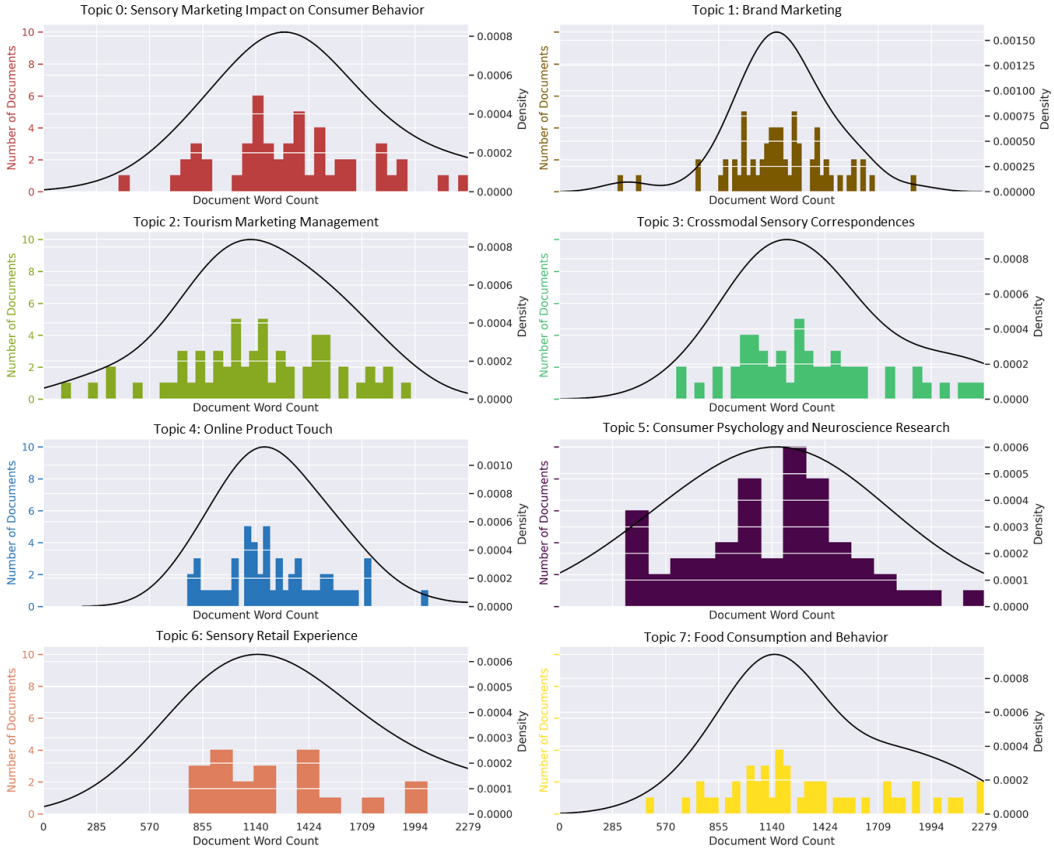


This demonstrates a crucial criterion in defining groups that match the subsumed articles in it. Otherwise, a distorted distribution could potentially cause biases in the resultant topics. To illustrate this potential issue, a hypothetical scenario can be examined involving a literature corpus consisting of ten articles. This corpus comprises nine articles, each consisting of 500 words, and one article with a significantly larger word count of 50,000. Statistical analysis suggests a strong probability that the topic generated from this corpus will be predominantly shaped by the influence of the 50,000-word article (AlSumait et al., 2009). Consequently, the nine extremely shorter articles within the corpus may not receive adequate representation within the generated topic.

Nevertheless, given the observed appropriate distribution in the current investigation, all topics generated by LDA were deemed valid and exhibited similarities to earlier studies (Wörfel et al., 2022). As a result, these groups were retained for subsequent analysis. Next, the author conducted a manual review of the associated articles to assign names to these eight topics, leading to the following headline classifications:

- Topic 0: Sensory Marketing Impact on Consumer Behavior
- Topic 1: Brand Marketing
- Topic 2: Tourism Marketing Management
- Topic 3: Crossmodal Sensory Correspondences
- Topic 4: Online Product Touch
- Topic 5: Consumer Psychology and Neuroscience Research
- Topic 6: Sensory Retail Experience
- Topic 7: Food Consumption and Behavior

Figure 8. Distribution of Document Word Counts by Dominant Topic



This SLR aims to systematically review the relationship between sensory marketing and digitization, sensory marketing, and the need for a measurement model within the digital context, and the potential synergies between sensory marketing and artificial intelligence, big data, and deep learning. Therefore, this dissertation´s scope is to be assigned to Topic 0, Topic 4, and Topic 6 to explore the most related scientific contributions within each group in more detail.

In Topic 0, 55 papers were grouped, focusing on the thematic area of sensory marketing and its influence on consumer behavior. Topic 4 consists of 57 papers and revolves around the scientific field of haptic research, specifically focusing on the online domain. As the third and final assigned topic, Topic 6 explores sensory retail experiences, encompassing 27 papers. All these topics have strong connections to the scientific field of this dissertation. On the one hand, the artifact to be developed aims to measure sensory marketing and strategically utilize it to positively influence consumer behavior in the online domain (Topic 0). In this context, the sense of touch plays a significant role (Topic 4), as it often represents the ultimate sense that guides the final decision to purchase a product. Research in this field is fundamental as it investigates how the potential direct haptic consumer engagement can be best compensated for through indirect methods such as images, texts, or interactive elements (VR, AR).

Furthermore, since general sensory experiences in retail are also of interest (Topic 6), scientific findings from the offline retail sector can potentially be transferred to the online domain. Despite the decision regarding the related topics, it could have also been considered to allocate Topics 3 and 5 to this work. However, as outlined in section 1.3, consumer psychology and crossmodal correspondences (related to sensory imagination) represent broader groups that serve as the fundamental basis for the three more specifically targeted topics, namely Topics 0, 4, and 6, which are regarded as relevant and fall within the narrower focus.

In summary, a total of 139 papers from the three topics were utilized as the scientific foundation for the subsequent SLR. As per the guidelines proposed by vom Brocke et al. (2009), it is essential to establish the scope of the literature review before commencing the SLR. The scope of this review was determined based on the detected problem environment (Research Question 1) and will be elaborated upon in the subsequent section according to Cooper´s literature review taxonomy (1988).

4.3.2. Defining the Review Scope

Following vom Brocke et al.´s (2009) guidelines for rigor in scientific literature reviews (SLRs), Cooper´s taxonomy (1988) needs to be taken into account to define the review scope (first phase) of this work. Specifically, this means that prior to conducting the review phase, a classification is made into categories of Cooper's taxonomy. The six characteristics, which were presented in more detail in section 3.3, have different categories, and the respective allocation of this work is illustrated in Table 11 by means of color highlighting.

Table 11. Cooper´s Taxonomy of Literature Reviews aligned with the Dissertation

Characteristic	*Categories*			
(1) Focus	*Research outcomes*	*Research methods*	*Theories*	*Applications*
(2) Goal	*Integration*	*Criticism*	*Central issues*	
(3) Organization	*Historical*	*Conceptual*	*Methodological*	
(4) Perspective	*Neutral representation*		*Espousal of position*	
(5) Audience	*Specialized Scholars*	*General Scholars*	*Practitioners / Politicians*	*General public*
(6) Coverage	*Exhaustive*	*Exhaustive and selective*	*Representative*	*Central/pivotal*

Author's elaboration adapted from (vom Brocke et al., 2009, p. 6)

The literature review can *focus* on various aspects, such as research outcomes, methods, theories, or applications. In this particular literature review, only peer-reviewed articles are considered (Levy & Ellis, 2006), including those related to theories and applications in the broader field of sensory marketing. The objective of this research is twofold: integration and identification of central issues, as they typically *"go hand in hand"* (Cooper, 1988, p. 110). Therefore, the literature review intends to highlight central issues, identify a gap in existing sensory marketing-related scientific contributions, and finally integrate them into a new assessment approach (Jackson, 1980). Therefore, it seeks to investigate which approaches have been examined in the respective research areas and in what methodological

manner. To facilitate the review process, a concept matrix was employed to group relevant articles (Webster & Watson, 2002), resulting in a *conceptual* and *methodological* organization. Consequently, the review will be presented from a *neutral* standpoint, and, finally, the intended audience for this SLR consists of specialized scholars and experts in the field of (sensory) marketing and computer science. While the artifact to be developed in this dissertation targets online marketing specialists who are practitioners in the identified problem environment, it is important to note that they were not part of the primary audience for the SLR.

Lastly, the review provides *representative coverage* of the relevant literature due to the application of AI-based literature retrieval (see section 3.3) and rigor within manual analysis according to the widely accepted SLR standards.

4.3.3. Topic Conceptualization

After defining the review scope, the second phase of vom Brocke et al.'s (2009) literature review framework focuses on the topic conceptualization and selecting a suitable search phrase specific to the research area. This phase is vital for elaborating a thorough literature review and shaping the study's direction. Choosing an appropriate search phrase involves considering factors such as the research domain, the desired extent and comprehensiveness of the literature review, and the availability of relevant resources. The goal is to capture the essence of the research topic without making the search phrase too broad or narrow, achieving a balanced approach that generates a meaningful and manageable literature collection.

However, the present dissertation employed the AI-supported STIRL method for topic conception. This innovative approach leverages artificial intelligence algorithms to automatically identify trending groups based on a priori-defined search terms in a text corpus. As a result, topic conceptualization was bypassed in favor of the STIRL approach, detailed in section 4.3.1, with three search terms regarding sensory marketing in conjunction with digitization, assessment methodologies, and big data/ AI.

4.3.4. Literature Retrieval Process

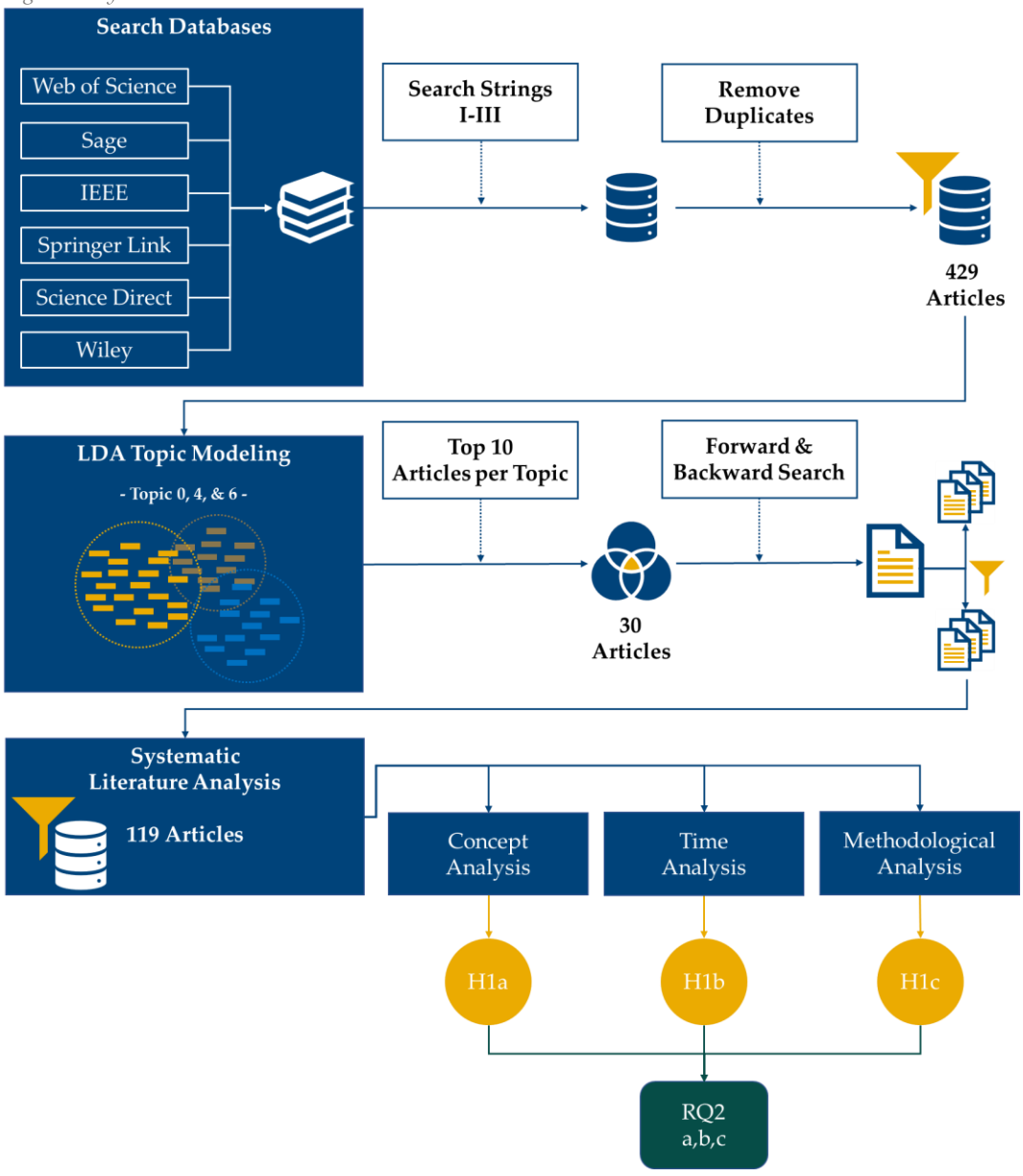
Searching for suitable Literature, according to vom Brocke et al.´s (2009) third phase of literature reviewing, involves conducting various types of searches, such as database searches, keyword searches, backward and forward searches, and finally, evaluating the retrieved scientific contributions. The literature search process employed in this dissertation was based on selecting the appropriate literature databases, defining the search terms, conducting backward and forward searches based on the retrieval results, and finally evaluating the literature that has been gathered in the literature corpus.

In section 4.3.1, an initial literature search was already carried out by means of searching six scientific databases with three different but related search terms. To handle the retrieved literature data, the peer-reviewed articles were collected by the bibliographic management program "Mendeley" (Parabhoi et al., 2017). Each article within the database was represented as an entry and characterized by several attributes related to Beel et al. (2010, p. 179), including publication type, title, author(s), publication document name, publication year, abstract, tags, keywords, and publisher. As a result, 429 unique articles were gathered and used to employ the unsupervised technique LDA to detect independent groups within the literature corpus based on likelihoods and resulted in eight topics, of which 139 articles were identified that aligned with the Topics 0, 4, and 6 with this thesis.

Due to time constraints, manually performing a forward and backward search for the 139 identified potential articles of Topic 0, Topic 4, and Topic 6 was not feasible. Instead, an "Accuracy-effort trade-off" (Gigerenzer & Gaissmaier, 2011, p. 456) had to be considered. Therefore, a heuristic approach was adopted to perform forward and backward searches only with each of the top ten articles of the three selected topics, resulting in a total of 30 articles. Essentially, the top ten articles deemed most representative of each LDA topic (Blei, 2012; Blei et al., 2002) were applied for these searches and highlighted in the search process in Figure 9. The chosen heuristic relies on the power of representative articles in the area of interest. Accordingly, it was assumed that if there were other relevant articles among the 139 potential papers, they would also be discovered through the forward-backward search, applying only the top 30 papers from the topic groups. This is also supported by the fact that nearly half of the retrieved literature in the

initial corpus prior to performing LDA was deleted due to a duplicate check (811 → 429 articles) (Higgins & Green, 2008). Lastly, the 30 articles were considered sufficient to obtain RQ1 by revealing if there is a noticeable research gap within the relevant articles through the analysis of the literature. The forward-backward searches revealed 119 unique articles that built the foundation for a comprehensive scientific literature analysis, which will be discussed in the next section.

Figure 9. Systematic Literature Review Search Process



4.3.5. Literature Analysis and Synthesis

In the fourth phase of vom Brocke et al.'s (2009) literature guidelines for SLRs, the primary objective of the literature analysis and evaluation is to select the identified articles based on their relevance. Due to the LDA grouping approach done before, 119 articles were gathered via forward-backward-searches based on the 30 identified most representative articles from three previously defined topic groupings, namely Sensory Marketing Impact on Consumer Behavior (Topic 1), Online Product Touch (Topic 4) and Sensory Retail Experiences (Topic 6).

Vom Brocke et al. (2009) suggest thoroughly examining, synthesizing, and reporting the articles from the literature corpus to provide a holistic overview of the research field in light of the research´s main goals. Concept analysis serves as the initial step in identifying and categorizing the various approaches related to sensory marketing into different concepts. These concepts aid in determining the underlying theories typically associated with the field of cognitive science, as well as the indicators of online sensory experiences and the necessary enhancements required in a growing digital business-to-consumer environment. As previously mentioned, an adjusted concept matrix (derived from Webster and Watson, 2002) will be employed to categorize the literature according to their respective concepts, as well as to assess RQ2.

Secondly, to gain insights into the historical development and evolution of the research's main topics, the analysis ties in with a time analysis. A systematic arrangement was employed for this by collecting the 119 articles according to their respective publication years and main concepts explored before, providing the basis for answering the tripartite RQ2.

As the third analytical step, a methodological review of the literature examines the range of methodologies employed in sensory marketing research. This analysis aims to understand the diversification of methods utilized and, in addressing the research question (RQ2), to determine the presence of established measurement models for sensory assessment and the possible need to build a new sensory assessment tool as intended in this dissertation.

The SLR results lie the foundation for answering RQ2a, b, and c, which are supported in more depth by the hypotheses H1a, H1b, and H1c (see section 4.3).

4.3.6. Research Agenda

As discussed earlier, the research agenda within the literature framework serves several purposes. Firstly, the literature search enables a comprehensive understanding of the current state of sensory marketing-related science, minimizing redundancy (Higgins & Green, 2008) and establishing connections with existing approaches (Cooper, 1988; Jackson, 1980). Furthermore, a new research agenda emerges by identifying research gaps. This agenda seeks to delve further into the research topic, exploring underlying sensory marketing theories and striving to generate novel findings and applications. These findings will be evaluated based on the articles retrieved via forward-backward searches, providing a robust foundation for future investigations. Ultimately, the research agenda acts as a roadmap for advancing knowledge and uncovering new insights in the field of sensory marketing and its assessment approaches in online domains.

4.3.7. Systematic Literature Research Result

Within this section, the results of the SLR will be presented and discussed in depth along three aspects, namely the conceptual, historical, and methodological attributes of the retrieved scientific literature, to validate the raised RQ2a, RQ2b, and RQ2c along the current research landscape in (online) sensory marketing.

4.3.7.1. ***Concept Analysis***

In this section, a comprehensive concept analysis of sensory marketing is undertaken, thoroughly exploring its key related research focuses. The main objective of the concept analysis is to identify subareas within sensory marketing research, highlighting research gaps in sensory marketing assessments and exploring opportunities for integrating AI methodologies (see section 2.2), which will be addressed in this dissertation. In other words, through a thorough examination and critical evaluation of 119 scientific contributions, the analysis aims to improve the understanding of sensory marketing by clarifying its conceptual boundaries and significance within a chronological framework spanning from 1987 to 2023. A common structure is applied to facilitate the concept analysis by utilizing the concept matrix from Webster & Watson (2002), as suggested by vom Brocke et

al. (2009), as a suitable foundation for categorizing the literature corpus. Accordingly, the 119 articles were assessed based on their respective titles, abstracts, and – if necessary – on the core text. Then, all articles were organized within the concept matrix, representing each article and its belonging to research focuses in a separate row. Table 12 showcases the final concept matrix (see page 157), with all listed articles presented on the left-hand side in numerical and historical order, along with their respective classification into the focus topics. These topics were preselected as they derived from the STIRL process that grouped the literature corpus into eight unique literature groupings. In the STIRL analysis conducted and reported in section 4.3.1, it was observed that no specific literature group has been identified regarding AI research and automation approaches in relation to sensory marketing. In light of these indications, these two areas of focus are included in the concept matrix as well to gain a more comprehensive understanding of the literature corpus and to examine the research gaps in these specific research directions to be closed in this dissertation.

Furthermore, the articles are classified among the types of articles with a particular view of the research´s outcomes. The types can vary from reviews to concepts, studies, or assessment approaches. This will be discussed in detail in section 4.3.7.3 by performing an additional methodological analysis.

A priori to the explanations of each focus topic in the concept matrix, it must be stated that the classification of a research article into one of the particular focus groups depends on its ability to clearly and explicitly align with one of the predefined groups. It is also crucial to acknowledge, for instance, that the mere incorporation of research related to haptics does not inherently justify classifying the article within the context of online product touch. However, if the article introduces original methodologies, strategies, or approaches concerning the knowledge base in digital haptic consumer targeting, it would be suitably categorized under the purview of online product touch.

The focus topic *(Online) Sensory Marketing & Consumer Behavior* subsumes articles that explore the influence of sensory marketing techniques, either in online or offline environments (or combined), on consumer behavior. Articles linked to this group investigate how sensory stimuli such as sight, sound, smell, taste, and

touch impact consumers' perceptions, emotions, attitudes, and purchasing decisions from a comprehensive viewpoint.

(Sensory) Brand Marketing describes the next focus topic. The group subsumes relevant articles that conduct research concerning the impact of sensory branding on consumer engagement, brand loyalty, and brand equity. The objective of these articles is to explore the dynamic relationship between brand marketing and sensory stimuli, aiming at discovering insights to craft sensory brand experiences that leave a lasting impression and connect deeply with consumers. Articles linked here are often closely connected to psychological research.

Another focus topic is *(Sensory) Tourism Management*. Tourism thrives on sensory impressions, which are often reactivated by sensory; in a way, these articles focus on effectively applying sensory triggers (see section 1.3.3) in this industry.

Also closely connected to sensory imagination is the next topic, namely *Crossmodal Sensory Correspondences.* Scientific work grouped within this topic deals with a variety of interdependencies of sensory impressions of one human sense (e.g., the sense of sight) and the possible influence on other sensory modalities, such as haptics in the sense of perceived temperature, through visual influences.

The next focus topic, *Online Product Touch,* is concerned with the scientific consideration of integrating haptic consumer contact, which is not directly possible in an online context. Research here is mainly based on compensating factors in the online domain, such as haptic, textual, and visual consumer address, but also VR and AR. Articles dealing with sensory enabling technologies (SETs) are also classified here.

Consumer Psychology, as a further focus area, is a scientific field underlying sensory marketing and is also very broadly defined. In the context of sensory consumer appeal, however, articles are assigned here in particular that have basic psychological concepts that affect the human senses. This includes, for example, consumer studies that deal with the NFT in a typically experimental study setup to target psychologically driven research goals.

Sensory Retail Experience is another topic closely related to sensory marketing at the operational level, not as a theoretical foundation but as a design option regarding the point of sale (POS). Research work grouped in this topic aims to design, coordinate, and strengthen the sensory consumer approach at the POS,

targeting to improve various marketing parameters (e.g., visit duration in the store). The basic assumption of this focus topic is that some of the scientific insights from the offline retail area can also be adapted to the online domain. This includes, for example, the color selection within the online store and images that force a sensory retail experience online as well.

The final focus topic identified by the STIRL Grouping is *Food Consumption and Behavior*. The role of sensory cues in relation to food consumption is crucial. Consequently, this particular area constitutes a significant research stream that impacts sensory marketing. For instance, it examines how colors, such as green for healthy or light blue for reduced fat, influence consumers' perception of food.

Furthermore, the author decided to add two additional focus topics to reveal a twofold research gap. The first topic to add is *Artificial & Big Data* because, in combination with sensory marketing, it represents a compelling avenue for research gap identification. While sensory marketing has been extensively studied and can be grouped into the aforementioned foci, its integration with AI and big data remains largely unexplored. By leveraging advanced algorithms and data analysis techniques, this emerging field holds the potential to uncover novel insights and strategies that capitalize on sensory cues to enhance online consumer experiences in e-commerce.

The second topic added to the conceptual categorization for potential research gap identification is *Automation*. This entails re-examining research on AI methods concerning sensory marketing in e-commerce, focusing on the level of automation in the methodology. Given the substantial amount of data involved, measurement methods, analysis techniques, and similar aspects should strive for automation to enhance efficiency in implementation. For instance, articles could explore not only AI but also the utilization of research findings through practical applications in e-commerce marketing.

In summary, it is expected that articles can have more than one clear focus, and this is accepted by the author. For example, an article may be assigned to both the focus topic Sensory Retail Experiences and Online Product Touch at the same time if it represents a combined focus of the research. Next, the conceptual allocation of the literature corpus is summarized in Table 12.

Table 12. Concept Matrix of Identified and Grouped Relevant Articles

Publication	Type				Focus								Gap	
		Outcome												
	Review	Concept	Study	Assessment	(Online) SM&CB	Brand Marketing	Tourism Marketing	Crossm. Sens.	Product Touch	Cons. Psychology	Sen. Retail Exp.	Food Cons. &	AI & Big Data	Automation
Dissertation		x		x	x				x		x		x	x
(MacInnis & Price, 1987)	x				x					x				
(Dodds et al., 1991)			x			x				x				
(Childers et al., 2001)			x							x	x			
(Eroglu et al., 2003)		x								x	x			
(Rosa & Malter, 2003)	x	x			x					x				
(Peck & Childers, 2003a)				x					x	x				
(Peck & Childers, 2003b)			x						x	x				
(Schlosser, 2003)			x							x				
(Citrin et al., 2003)			x						x		x			
(Escalas, 2004)			x			x				x				
(Simmons et al., 2005)			x					x		x		x		
(Peck & Childers, 2006)			x		x				x					
(Parsons & Conroy, 2006)			x		x				x	x	x			
(Peck & Wiggins, 2006)			x		x				x					
(Grohmann et al., 2007)			x						x	x				
(Peck & Shu, 2009)			x						x		x			
(Cheng et al., 2009)			x					x		x	x			
(Demangeot & Broderick, 2010)			x		x						x			
(Lwin et al., 2010)			x					x						
(Krishna, Elder, et al., 2010)			x					x						
(Krishna, Lwin, et al., 2010)			x							x				
(Nuszbaum et al., 2010)				x					x					
(Elder & Krishna, 2010)			x		x							x		
(O'Brien & Toms, 2010)				x							x			
(J. U. Kim et al., 2010)			x							x	x			
(Ha & Lennon, 2011)			x							x	x			
(Shu & Peck, 2011)			x						x	x				
(Peck & Johnson, 2011)			x						x	x				

Publication	Type				Focus									Gap	
		Outcome													
	Review	Concept	Study	Assessment	(Online) SM&CB	Brand Marketing	Tourism Marketing	Crossm. Sens.	Product Touch	Cons. Psychology	Sen. Retail Exp.	Food Cons. &		AI & Big Data	Automation
(Spence & Gallace, 2011)	x							x	x						
(Rose et al., 2012)				x	x						x				
(Spence, 2012)	x				x			x				x			
(Krishna, 2012)	x				x										
(Shen & Sengupta, 2012)			x						x						
(Klatzky & Peck, 2012)			x		x				x						
(Peck et al., 2013)			x		x				x						
(Yazdanparast & Spears, 2013)			x						x						
(Spence et al., 2014)	x				x					x	x				
(Krishna & Schwarz, 2014)	x				x					x	x				
(Spears & Yazdanparast, 2014)			x		x			x		x					
(Choi & Taylor, 2014)			x						x						
(González-Benito et al., 2015)			x			x			x						
(Brasel & Gips, 2015)			x						x	x					
(Shen et al., 2016)			x						x			x			
(Pino et al., 2016)			x						x						
(Imschloss & Kuehnl, 2017)			x					x	x		x				
(San-martín et al., 2017)			x						x		x				
(T. L. Huang & Liao, 2017)			x		x						x				
(W. Liu et al., 2017)			x						x						
(Rodrigues et al., 2017)			x		x				x						
(Hilken et al., 2017)			x								x				
(Atasoy & Morewedge, 2018)			x							x					
(de Vries et al., 2018)			x		x				x	x		x			
(Y. Liu et al., 2018)			x		x				x						
(Chung et al., 2018)			x						x						
(H. K. Lee & Ahn, 2018)	x				x				x						
(Racat et al., 2018)			x		x				x	x					
(Biswas, 2019)	x				x						x				
(Flavián et al., 2019)	x	x			x		x								
(J. Heller et al., 2019a)			x								x				

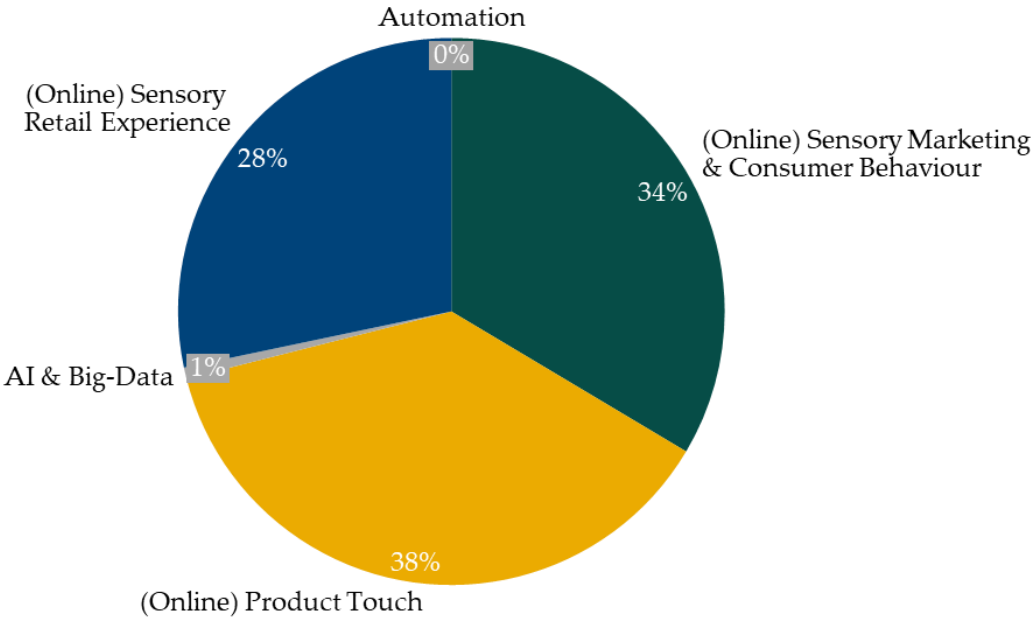
Publication	*Type*				*Focus*								*Gap*	
		Outcome												
	Review	*Concept*	*Study*	*Assessment*	*(Online) SM&CB*	*Brand Marketing*	*Tourism Marketing*	*Crossm. Sens.*	*Product Touch*	*Cons. Psychology*	*Sen. Retail Exp.*	*Food Cons. &*	*AI & Big Data*	*Automation*
(J. Heller et al., 2019b)			x						x		x			
(Jiménez-Marín et al., 2019)	x				x					x				
(Y. (Alison) Liu et al., 2019)			x		x				x	x				
(Petit et al., 2019)	x				x			x	x		x			
(Pizzi et al., 2019)			x								x			
(Rauschnabel et al., 2019)			x			x				x				
(Riedel & Mulcahy, 2019)			x		x				x		x			
(C. Adams & Doucé, 2020)			x		x			x						
(Fook & McNeill, 2020)			x								x			
(Hwang et al., 2020)			x		x					x				
(Jha et al., 2020)			x		x				x		x			
(Kang et al., 2020)			x		x									
(Kühn et al., 2020a)			x						x		x			
(Kühn et al., 2020b)			x						x		x			
(Luangrath et al., 2020)			x							x				
(Ornati & Cantoni, 2020)			x		x			x	x					
(Pino et al., 2020)			x						x					
(Wedel et al., 2020)	x	x									x			
(De Canio & Fuentes-Blasco, 2021)			x						x		x			
(Donato & Raimondo, 2021)			x						x					
(Anubhav Mishra et al., 2021)			x		x					x				
(Rejeb et al., 2021)	x										x			
(Silva et al., 2021)			x		x				x					
(Atilgan & Bayindir, 2022)			x						x		x			
(Bhatia et al., 2022)		x			x			x						
(Campo et al., 2022)	x				x			x				x		
(Chung et al., 2022)			x		x				x	x				
(Doucé, 2022)			x					x			x			
(Elder & Krishna, 2022)	x				x					x	x			
(Fritz et al., 2022)			x							x		x		

Publication	*Type*				*Focus*								*Gap*	
		Outcome												
	Review	*Concept*	*Study*	*Assessment*	*(Online) SM&CB*	*Brand Marketing*	*Tourism Marketing*	*Crossm. Sens.*	*Product Touch*	*Cons. Psychology*	*Sen. Retail Exp.*	*Food Cons. &*	*AI & Big Data*	*Automation*
(Gatter et al., 2022)			x						x		x			
(Hermes et al., 2022)			x							x	x			
(Hilken et al., 2022)			x			x				x	x			
(Jiménez-Marín et al., 2022)			x		x						x			
(Seeun Kim et al., 2022)			x						x					
(Kumar, 2022)	x					x					x			
(H. K. Lee & Choi, 2022)			x						x	x				
(H. K. Lee et al., 2022)			x						x					
(P. Li et al., 2022)			x		x				x					
(Løkke-Andersen et al., 2022)			x					x	x					
(Luangrath et al., 2022)			x						x	x				
(Motoki & Iseki, 2022)			x		x									
(Petit et al., 2022)			x							x		x		
(Sagha et al., 2022)			x		x									
(Shah Alam et al., 2022)				x							x			
(Spence & Van Doorn, 2022)	x							x				x		
(Stead et al., 2022)	x				x						x			
(Zheng & Bensebaa, 2022)			x		x				x	x				
(Barta et al., 2023)			x								x			
(Inoue, 2023)			x						x	x				
(Jayaswal & Parida, 2023)	x				x						x			
(J. H. Kim et al., 2023)			x		x	x								
(J. Lee & Lim, 2023)			x					x				x		
(Massa & Ladhari, 2023)	x				x				x					
(Rabata & Al Khasawneh, 2023)			x		x									
(Ringler et al., 2023)			x							x	x			
(Ruusunen et al., 2023)			x		x				x					
(C. W. Wu & Monfort, 2023)			x		x								x	
(J. Wu et al., 2023)			x						x	x				
(M. Zhang et al., 2023)			x		x				x					

In addition to providing an overview of the previously generated literature corpus, Table 12 also presents the classification of the scientific articles in the previously discussed focus topics and the classification of this dissertation (row 0). As explained in section 4.3.1, this dissertation is assigned to the STIRL topics with a direct focus on sensory marketing (Topic 0, Topic 6) and product touch (Topic 4), given the significant importance of haptic compensation and imagination options. Moreover, this work primarily focuses on developing an assessment approach for sensory communication elements in the digital context, incorporating AI and big data, and aiming to automate computer-assisted sensory assessments.

A closer examination of the eight focus topics and the assigned foci of the 119 articles from the literature corpus reveals three major research focuses in relation to the dissertation and the defined reference foci, approximately divided into thirds. These divisions are further illustrated in Figure 10. Following that is (Online) Sensory Marketing and Consumer Behavior with 51 articles (34%), and Online Product Touch has the largest share with 57 articles (34%). Other topics considered relevant for the dissertation, such as AI & Big Data with only one article (1%) and Automation (0%), are clearly underrepresented.

Figure 10. Distribution of The Focus Topics Assigned to This Dissertation



The other focal topics, which were previously deemed to have secondary significance (at most indirectly) to the scope of this dissertation, exhibit notably lower prevalence within the literature corpus. The least represented focus areas include Brand Marketing, with only seven articles; Tourism Marketing, with just one article; Food Consumption and Behavior, with ten articles; and Crossmodal Correspondences, with 17 references in the literature corpus. This significant disparity in representation allows asserting the effectiveness of the three defined search terms from section 4.3.1. Furthermore, it indicates that additional articles, closely linked conceptually, were discovered through the forward-backward searches associated with them. It is important to note that the topic of Consumer Psychology, encompassing a total of 43 articles, falls outside of the primary conceptual literature analysis. However, as previously mentioned in this SLR, these articles display interdependencies with other topics. Hence, eleven papers within the literature corpus exhibit a shared specialization in research pertaining to online product touch. Additionally, twelve papers focus on the intersection of consumer psychology with sensory retail experiences or sensory marketing and consumer behavior. This finding underscores the unsurprising notion that experimental psychology is a vital factor in sensory marketing and its associated subtopics. Exploring the effects of sensory cues on consumer behavior, is an area of research firmly grounded in psychology. In addition, many more articles within the literature corpus have at least an indirect connection to the research field of consumer psychology. However, they primarily serve as foundational pieces, supporting potential outcomes such as purchasing behavior rather than directly aligning with this study's thematic focus.

Lastly, it is noteworthy that there is no discernible trend dedicated explicitly to the keywords utilized in search term three (big data, artificial intelligence, deep learning). This observation indicates that integrating big data and artificial intelligence into sensory marketing has not yet received significant conceptual attention or emerged as a prominent trend in scientific literature. Thereby, hypothesis H1a can be partly confirmed without the important research stream of AI and big data. Thus, a research gap between sensory marketing research and AI / big data and automation becomes evident.

4.3.7.2. Time Analysis

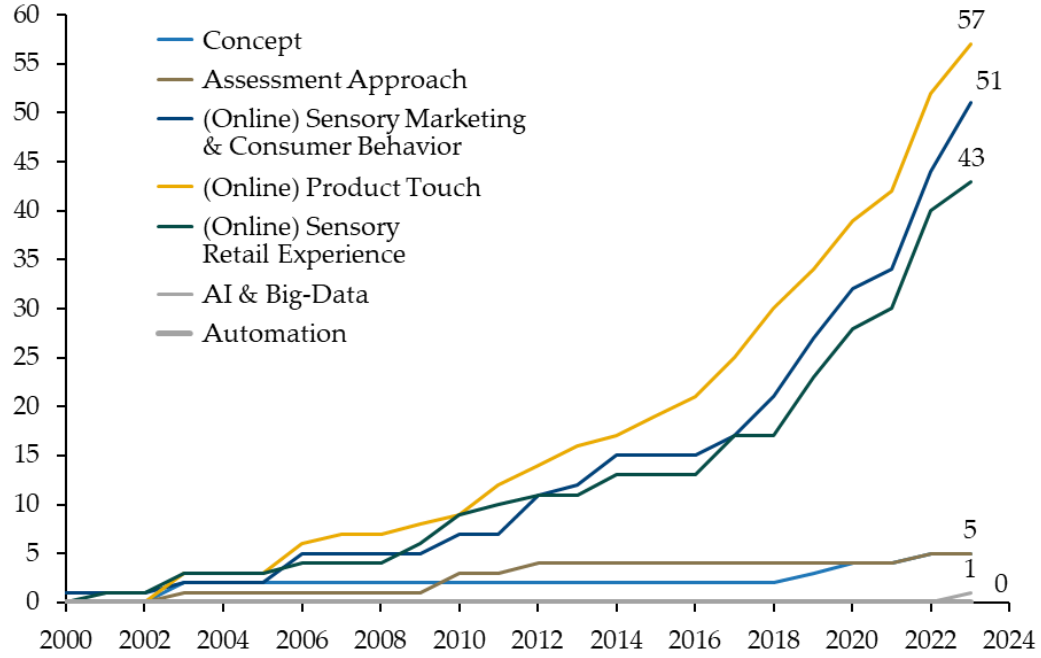
Reviews can additionally entail a chronological order to detect changes within scientific history (Cooper, 1988). In the present case, a historical view of the literature corpus will be taken according to Cooper´s goal characteristic for investigating RQ2, which assumes a research gap between sensory marketing-related topic groups and concepts, assessment approaches, AI/big data, and automation over time. The forward-backward search method produced a corpus of articles corresponding to an observation period from 1987 to 2023.

Considering all the underlying focal areas and the entire timeframe, it becomes evident that consumer psychology, in particular, has been the predominant subject regarding the number of articles from a chronological perspective, holding this position until 2026. For instance, during the period leading up to 2005, ten scientific articles were published focusing on consumer psychology, while all other focal areas had a maximum of three articles. This discovery is not surprising and underscores the fact that psychological studies on purchasing behavior serve as the foundational basis for many other articles within related research domains, particularly in the context of offline and online sensory marketing. Topics that fall outside the scope of this dissertation, such as food consumption and behavior, will not be extensively discussed here, as they hold lesser significance within the literature corpus due to the predefined search terms.

However, upon conducting a meticulous examination of the prioritized focus topics (Topic 0, Topic 4, Topic 6), it becomes apparent that no discernible research priority can be attributed to them prior to the year 2000. The progression of these three sensory marketing-related topics from that time until the present is depicted in Figure 11. The graphs, presented within the Cartesian coordinate system, delineate the number of scientific publications plotted on the ordinate axis concerning the corresponding years along the abscissa. This graphical representation effectively underscores the temporal evolution of the research foci, particularly emphasizing the developments observed in the past decade. This salient observation stems from the notable upsurge in the number of articles within the generated literature corpus, a surge that commenced after 2010. Notably, this trend is particularly conspicuous in the research frame about the online product touch phenomenon. Similarly, the specific topics associated with sensory

marketing also manifest such temporal developments, albeit with specific variations in timing. For instance, the breakthrough in (Online) Sensory Marketing and Consumer Behavior was realized approximately two years after this period, mirroring the trajectory observed for sensory retail experiences. Evidently, this delay can be attributed to the well-established definition of sensory marketing, as expounded upon in Krishna's review article, which served as a fundamental catalyst for further research by identifying crucial research gaps (Krishna, 2012).

Figure 11. Number of published Articles per Focus Topic

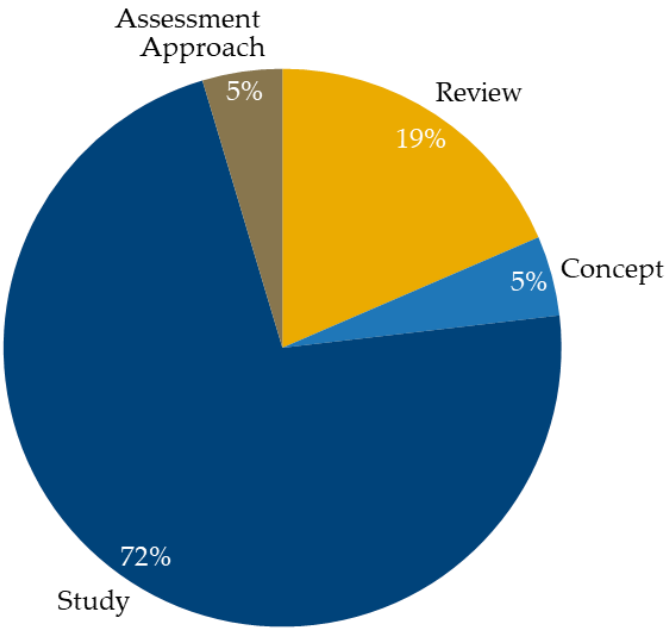


Moreover, Figure 11 incorporates the research type and the selection criteria for concepts and assessment approaches employed in this dissertation. In conjunction with the designated focal areas of AI, big data, and automation, which were initially identified as prospective research gaps, the depiction above elucidates the existing disparity between the current research trends and the topics that remain unexplored. This apparent divergence highlights the inability to fully confirm hypothesis H1b, thus revealing the assumed research gap. Furthermore, the subsequent section delves into a methodological analysis at an additional level.

4.3.7.3. Methodological Analysis

In addition to the conceptual and historical analyses, a comprehensive examination of the methodologies employed in each case is undertaken. This includes a specific focus on the research outcomes as integrated within the concept matrix. A categorization is established, distinguishing between review articles, articles presenting novel concepts, as well as empirical studies and assessment approaches. It is important to note that the category of empirical studies is presented in an aggregated form, encompassing various subtypes, such as functional magnetic resonance imaging (fMRI) studies, experimental studies conducted within academic contexts or practical business-to-business and business-to-consumer settings, and traditional survey-based studies. However, for the sake of clarity and the specific scope of this dissertation, an aggregated presentation is preferred and displayed in Figure 12, uncovering the identification of existing concepts on one hand and assessment approaches on the other. It presents the distribution of the pre-selected literature corpus, highlighting the methodological categorization. Naturally, combinations of these methodologies are also conceivable. As a result, it is essential to note that certain articles can be assigned to multiple method classifications, resulting in potential overlap.

Figure 12. Distribution of Methodical Foci among Topics 0, 4, and 6



As anticipated, the majority of the corpus, comprising 78 articles (72%), falls under the category of independent studies. Additionally, the literature corpus includes 20 review articles (19%), three of which combine with concepts (Flavián et al., 2019; Rosa & Malter, 2003; Wedel et al., 2020). Five papers (5%) are categorized as concepts, with three of them presenting a concept simultaneously. Notably, most of these concept articles are centered around sensory marketing and have been published within the past eight years. There are also five assessment approaches (5%) existing in the corpus, and these are mainly product touch-related (Nuszbaum et al., 2010; Peck & Childers, 2003a) and (online) sensory retail experience-related (O'Brien & Toms, 2010; Rose et al., 2012; Shah Alam et al., 2022). Articles assigned to this category may have contributed to the development of new scales, indices, or other measurement methods. These articles will be further scrutinized in section 4.4 to assess their impact on this dissertation. However, it can already be asserted that, from a methodological standpoint, no articles have been identified that specifically investigate the evaluation of sensory e-commerce elements, leading to confirmation of H1c. In addition, it supports the raised RQ2c.

4.3.8. Discussion

This chapter aimed to identify the relevant research fields around sensory marketing. A systematic literature review (SLR) was conducted, which identified 119 relevant approaches. These approaches were then categorized into a concept matrix like the classification used in this dissertation. The SLR revealed that the primary research streams revolve around the topics of Sensory Marketing & Consumer Behavior, Sensory Retail Experiences, and Product Touch. However, it was noted in parallel that virtually no research specifically focused on sensory marketing and AI/Big Data and automation contributes to a substantive research gap. This work addresses two research gaps - methodological and substantive - therefore, the methodological approach was also thoroughly examined. By applying the literature search method proposed by Buchkremer et al. (2019), RQ2 was further supported. Moreover, the literature analysis facilitated the investigation of RQ3. In the following steps, the existing knowledge will be utilized to address the dissertation´s main research question and to reveal a need to look for additional research in other scientific disciplines.

4.4. RELATED WORK

"When rigorously conducted, reviews represent powerful information sources for researchers and practitioners looking for existing evidence to guide their decision making and managerial practices" (Templier & Paré, 2015, p. 114).

Following the quote, this section builds on the SLR conducted previously and highlights if and to what extent the dissertation´s scope fits into the identified literature from the three preselected topics, 0,4, and 6. Thus, this section aims to answer RQ3, which is intended to explore: *"To what extent is the dissertation´s scope integrable to existing sensory marketing-related literature aiming at enhancing the online sensory consumer experience?"* Answering this question serves two crucial purposes in this dissertation. First, it ensures that the study is based on the latest research and knowledge. Second, it prevents the author from undesirably duplicating existing research studies, thus optimizing the use of resources.

In addition, this section explores related AI assessments with slightly different scopes and related indices from marketing and e-commerce research fields. Exploring these two complementary research directions serves two primary purposes. Firstly, it helps to differentiate this study from existing research efforts. Secondly, it facilitates an examination of established concepts and indices to determine whether assessment mechanisms or similar insights can be adapted for sensory online marketing and its manual and automated evaluation.

4.4.1. Categorization into Related Topics

The primary objective of a review section is to inspire the research study and effectively identify and illustrate a gap in existing research, enabling the researcher to assert and validate the uniqueness of their work (Boell & Cecez-Kecmanovic, 2014; vom Brocke et al., 2015). Accordingly, the three research topics revealed by the LDA technique (see section 4.3.1), namely (Online) Sensory Marketing & Consumer Behavior, (Online) Product Touch, and (Online) Sensory Retail Experiences, will be further investigated in the subsequent sub-sections. As mentioned earlier, articles can deal with several topics simultaneously and will be discussed below under the topic of which they have the largest intersection.

4.4.1.1. (Online) Sensory Marketing & Consumer Behavior

The first topic (0) derived from the LDA process deals with a combination of sensory marketing and its impact on consumer behavior. Next, the articles assigned to topic zero are grouped, and the ones with the most crucial insights for this work are discussed based on their shared themes and possible distinctions.

The most prominent group of articles revolves around imagery and perception and is highly influenced by MacInnis and Pride (1987). Their scientific paper characterizes imagery as a processing mode representing multisensory information in working memory. In contrast, Elder & Krishna (2010) focus on how multisensory ads can result in higher taste perceptions than ads focusing on taste separately, mediated by positive sensory thoughts. Spears & Yazdanparast (2014), on the other hand, propose that the consumer imagination can be suppressed when preferred haptic sensory information is missing. Still, it enhances purchase intentions compared to considering product attributes, as it enables consumers to integrate information more efficiently. Spence (2012) also examines managing sensory expectations for products and brands through sound and shape symbolism. His research underlines the significance of creating congruent product-related sensory expectations in consumers' minds by utilizing sound symbolism in brand names and shape symbolism in labeling and packaging design. With a focus on the online domain, another article explores the effect of recommended product presentation on consumers' usage intentions of websites, mediated by mental simulation (H. K. Lee & Ahn, 2018). This study reveals that when compliments of clothes are vertically presented online, consumers experience a greater sense of mental simulation, influencing their usage intentions. Hence, these articles stress the relevance of sensory triggers in shaping consumer perceptions and suggest that imagery can play a pivotal role in influencing consumer preferences, as already highlighted in section 1.3.3.

In Topic 0, two articles present broader perspectives on sensory marketing and its implications for consumer behavior. In this regard, Krishna´s (2012) seminal review article, in particular, is the first to deal with the definition and concept of sensory marketing as a means of engaging consumers' senses to influence perception, judgment, and behavior. Moreover, Krishna & Schwarz (2014) explore the intricate relationship between sensory experiences, grounded cognition, and

consumer responses. Both papers stress the subconscious effects on consumer perceptions that sensory marketing and sensory cues can cause.

Another set of articles within topic 0 emphasizes the value of multisensory experiences. Rose et al. (2012) developed an empirical model of online consumer experiences (OCE) within internet shopping websites that distinguishes between the cognitive and affective components of online customer experience and builds a new measurement model for antecedents and outcomes of OCE in e-commerce. Stead (2022) presents a cross-disciplinary bibliometric review of multisensory customer experiences, offering a research agenda to investigate the complex interactions between multiple senses and consumer behavior. The need to consider various human senses in shaping consumer perceptions and designing marketing strategies becomes obvious, leading to serve as underlying sources for this work.

Furthermore, the emerging technologies in sensory marketing form a compelling theme. In this respect, Huang & Liao (2017) investigate how augmented-reality interactive technology can create multisensory flow experiences in e-commerce. Wu & Monfort (2023) examine the role of artificial intelligence (AI) as a marketing strategy and its impact on firm performance by incorporating the food industry, which is also being investigated in this work. These articles shed light on the potential of cutting-edge technologies to create engaging and enjoyable customer interactions.

In summary, (Online) Sensory Marketing & Consumer Behavior covers many topics. On the one hand, the articles highlight the significant role of sensory imagination in online and offline consumer perception and decision-making. In addition, there is evidence in the literature that integrating artificial intelligence with sensory marketing is just beginning to emerge as a significant area of research. Consequently, the articles in this topic area serve as the theoretical foundation for this thesis, as the insights from these articles will be used to develop the following DSR artifact. Since this thesis is not a replication of existing work in the field of sensory marketing, it should accordingly be distinguished from the articles presented previously, although it will subsume their content.

4.4.1.2. ***(Online) Product Touch***

(Online) Product Touch (LDA topic 4) has become a significant topic in consumer behavior research, exploring the influence of haptic (touch) information on various aspects of consumer decision-making. Several studies have examined individual differences in the preference for haptic information. In this regard, Peck and Childers (2003a) developed the "Need for Touch" (NFT) scale, which measures individual differences in preferences for haptic information. They found that NFT influences the relationship between direct experience and confidence in judgment. Haptic information has been found to be crucial for product judgments, especially regarding material properties (Peck & Childers, 2003b), and mere touch can increase perceived ownership of objects for both owners and non-owners, affecting object valuation (Peck & Shu, 2009). Additionally, touch can be persuasive and influential, regardless of informative content (Peck & Wiggins, 2006). According to Grohman et al. (2007), allowing customers to touch products can positively influence product evaluations, particularly when tactile input is diagnostic and related to product quality. Individual differences in using haptic information have been explored as being moderated by high and low NFT individuals, affecting confidence and frustration during product evaluation (Nuszbaum et al., 2010). Additional criteria related to touch are emotional attachment, psychological ownership, and affective reaction, which have been identified as key drivers of the endowment effect (Shu & Peck, 2011). Moreover, the persuasiveness of touch is influenced by individual differences and involvement in the persuasive appeals by the autotelic NFT (Peck & Johnson, 2011). As Shen and Sengupta (2012) state, the effect of touch on evaluations is also moderated by the hand used to hold an object.

In the quest to enhance online shopping experiences, researchers explored various strategies to address haptic sensory limitations. Choi & Taylor (2014) found that 3D virtual advertising outperformed 2D in effectiveness, with vivid mental imagery acting as a mediator. González-Benito (2015) revealed that reputable brands served as substitutes for the NFT, especially in product categories with a higher NFT. San-martin (2017) discovered a negative link between NFT and perceived product quality in online purchases. However, e-commerce orientation mitigated this effect. On the other hand, subjective norms and buying impulsiveness showed no significant impact. Liu et al. (2017) highlighted the

influence of product touch on buying decisions, primarily when consumers' mental representation was concrete, mediated by perceived risk and ownership.

Another avenue explored is the impact of mental imagery (J. Heller et al., 2019a), as haptic sensory experiences can also be generated within consumers' minds through the use of images and texts (W. Liu et al., 2017; Ruusunen et al., 2023). Rodrigues et al. (2017) evaluate the potential of textual haptic information to minimize the NFT effects in online environments, revealing that providing richer perceptual cues adds value to the customer's e-commerce journey. Ornati and Cantoni (2020) explore surface haptic interaction experiences in e-commerce, demonstrating that providing tactile and visual cues through interactive haptic effects can enhance the fashion customer's online shopping experience. Additionally, both images and texts are investigated in this dissertation as well.

An in-depth analysis of the most pertinent articles related to topic 4 unveils a discernible trend in online sensory marketing: the advancement and adoption of virtual reality (VR) (K. C. Lee & Chung, 2008) and augmented reality (AR) (Chung et al., 2018; J. Heller et al., 2019b; Massa & Ladhari, 2023; M. Zhang et al., 2023). VR and AR are designed to overcome the limitations of the digital consumer context (Petit et al., 2019) primarily by engaging the sense of touch (J. Wu et al., 2023). This resulting research stream is also titled *"The vicarious haptic effect"* (Luangrath et al., 2022, p. 306), described as the act of observing a hand in direct contact with a product within a virtual setting (Y. Liu et al., 2018).

Multisensory experiences, particularly touch-based ones, significantly impact product evaluation and consumer responses. Spence & Gallace (2011) underscore the importance of tactile branding and marketing through pointing out how touch influences overall product appreciation and packaging perception. Mishra et al. (2021), on the other hand, explore the impact of technology interfaces like augmented reality (AR) on hedonic and utilitarian products, emphasizing AR's superiority for hedonic experiences. Touch interfaces, on the other hand, provide more satisfaction for utilitarian products.

As the haptic sense is the most challenging to deceive and holds particular importance for consumers in general (Krishna, 2012) and in online settings (Citrin et al., 2003), without being directly addressable. Therefore, the findings from Topic 4 play a crucial role in developing the artifact for this dissertation.

4.4.1.3. (Online) Sensory Retail Experiences

The topic of (Online) Sensory Retail Experiences, explicitly focusing on the role of sensory cues in offline and online shopping behavior, builds the third content pillar of this related work section. Articles related to Topic 6 can be subdivided into three identifiable groupings and will be presented below.

The first research stream is related to multisensory perspectives in retail atmospherics. Multisensory perspective research has emphasized the need for further investigation into the influence of various sensory cues on consumer behavior (Spence et al., 2014). Studies have explored the impact of multisensory congruence between different cues, such as music and flooring, on product evaluations (Imschloss & Kuehnl, 2017). Multisensory congruent environments lead to more favorable product evaluations, with purchase-related self-confidence mediating these effects (Biswas, 2019; Elder & Krishna, 2022).

The second and much bigger grouping belongs to motivations and atmospherics in online retail shopping. Several studies have investigated the motivations for shopping behavior in online retail settings (Childers et al., 2001). Both utilitarian and hedonic dimensions are found to be important, and online shopping attitudes are influenced by immersive, hedonic aspects of the shopping environment, as well as traditional utilitarian motivations. Factors such as navigation, convenience, and substitutability for in-person examination of products play a significant role in shaping consumers' attitudes toward online shopping. Similarly, Eroglu et al. (2003) empirically tested a model to explore how atmospheric cues in online stores influence shoppers' emotional and cognitive states, affecting their satisfaction, attitudes, and approach/avoidance behaviors during the shopping process. Additionally, the impact of online store atmospherics on consumer emotions has been explored, with research focusing on the effect of elements such as music and color on emotional responses (Cheng et al., 2009). Results showed that music and color significantly influence consumers' emotional responses, with fast music and warm colors eliciting more arousal and pleasantness in shoppers. The congruency of these atmospheric factors further enhances their effects on emotions. Studies have examined the role of atmospheric responsiveness, with findings indicating that online atmospheric cues have a significant effect on pleasure and perceived risk (Ha & Lennon, 2011). Consumers with high

atmospheric responsiveness experience more joy and less risk in online shopping, leading to greater patronage intention. Pleasure and perceived risk mediate the relationship between the website´s atmosphere and patronage intention. In general, sensory stimuli have been found to play a major role in online shopping. Parsons & Convoy (2006) investigated customers' desire for sensory stimuli in virtual stores by reviewing the leading e-commerce sellers and found that customers have a strong desire for sensory input.

In addition, the third research grouping within topic 6 has emerged in the last decade on augmented and virtual reality (AR/VR) in online retailing and is now determinant in current research and underpins its importance. However, this research stream cannot be strictly separated from the touch-focused Topic 4, but some sources have stronger links with Topic 6. Consequently, these focus more holistically on the influence and role of AR and VR on and in the consumer journey. Several review articles already dealt with AR and VR and highlighted their disruptive potential in marketing practice and impact on purchase intentions (Barta et al., 2023; Jayaswal & Parida, 2023; Kumar, 2022; Rejeb et al., 2021).

Both technologies have different success factors, as emphasized by Hilken et al. (2022). For instance, they proved that AR is more efficient in eliciting purchase intentions due to its product-focused mental imagery options. Additionally, AR-based service augmentation enhances customer value perceptions and decision comfort (Hilken et al., 2017). Contrastly, VR stores can elicit both hedonic and utilitarian shopping orientations in consumers (Pizzi et al., 2019). High-interactive technology with haptic touch has been found to provide a more visually appealing and enjoyable consumption experience for customers (Riedel & Mulcahy, 2019). Moreover, Alam et al. (2022) explore consumers' usage intention of AR in online buying contexts more deeply in a technology-acceptance measurement approach, exploring effects such as perceived enjoyment, personal innovativeness, and self-efficacy that shape consumers' attitudes and purchase intentions.

The grouped articles within Topic 6 cover various aspects of sensory retail experiences, including motivations for online shopping, the impact of online store atmospherics on consumer emotions, and the role of AR and VR in enhancing online consumer experiences. Thus, these presented articles build underlying knowledge that will be applied within the dissertations' artifact to be developed.

4.4.2. Sensory Marketing-Related AI-Assessments

Rating products by applying scores or free-text assertions is a task often accomplished in the food industry and food research (Bécue-Bertaut et al., 2008). Therefore, it is not surprising that most AI-based assessment approaches in the field of sensory marketing have focused on retrieving and interpreting online content related to food. However, only a few articles have fundamentally combined sensory marketing research with big data methods to gain new insights from relatively large datasets. While several studies have explored the automatic retrieval and interpretation of sensory data, they employ various methodologies and pursue different objectives. For instance, most of the investigations concentrate on text-based analyses. For instance, Kim et al. (2018) proposed a sensory keyword-based model for evaluating noodle soups by analyzing a substantial amount of online reviews to predict consumer product acceptance. They applied previously described NLP methods like skip-gram (see section 4.1.2.3) to evaluate smell, taste, and other product attributes and proved that results between products can be conveniently analyzed.

On the other hand, lexicon-based approaches are also common in sensory AI assessments. These approaches are recognized for extracting subjectivity and determining semantic orientation in texts (Taboada et al., 2011). Hence, they form the basis for sentiment analysis (Hamilton & Lahne, 2023). In the context of sensory evaluations, lexicon building via AI strives to extract domain-specific information about the product´s sensory properties, moving beyond a narrow focus on positive or negative feelings (Drake & Civille, 2003). As a case in point, Hamilton and Lahne (2020) utilized NLP techniques to construct a sensory lexicon based on online reviews, focusing on flavor classifications of whisky. Another article by Meng et al. (2018) addressed the identification of appropriate scent terms in product marketing using a data-driven approach, and Calvert et al. (2023) applied text mining on cider website descriptions to build a framework for extracting sensory-specific language.

Despite the prevalence of text-related analyses, Mureşan et al. (2018) focused on investigating images with deep-learning neural networks for fruit identification.

This dissertation targets to leverage and modify the AI-based analytical tools employed in these aforementioned articles, providing a comprehensive description and adaptation of these methods in the DSR implementation phase (see section 5.2).

4.4.3. Related Indices

To attain a comprehensive understanding of extant measurement methodologies and developed indices, this section on related work concludes with three distinct perspectives. Initially, a holistic investigation is conducted into indices within the domain of e-commerce and website design. Next, noteworthy marketing indices outside the purview of online research are accentuated. Lastly, special attention is directed toward the Web Quality Index (WQI) and its measurement attributes, which will be employed in constructing a novel measurement approach for online sensory marketing in this work (Artifact I).

4.4.3.1. ***Indices Overview related to E-Commerce / Website***

A large number of publications in the scientific literature deal with evaluation models, which serve as a basis for assessing websites and diverse internet content. However, the motivation driving the development of these models varies considerably. One research stream originates from the tourism sector comprising website evaluations of hotels (Salem & Čavlek, 2016), destinations (Fernández-Cavia et al., 2014; Stepchenkova et al., 2010), airlines (Tsai et al., 2011), Governments (Vidrio-Baron et al., 2009) and booking services (Dickinger & Stangl, 2013).

Another research direction focuses on websites and e-commerce shopping sites particularly. According to Chiou et al. (2010), these website assessment frameworks typically adhere to three main approaches: an information systems (IS) perspective (Aladwani & Palvia, 2002), a marketing perspective, or a hybrid approach that combines elements from both domains. An IS assessment provides a measure of the website´s technical proficiency. Thus, the evaluation primarily centers on the technological website elements, like navigability, usability, or information quality (Abdallah & Jaleel, 2015). In contrast, the marketing approach emphasizes features such as customer services, promotion initiatives, and online transactions. Combined frameworks represent a blend of both approaches, incorporating aspects from both the IS and marketing perspectives (Hansen & Bjørn-Andersen, 2013). As Abdallah & Jaleel (2015) note, there is no standardized scientific framework for analyzing e-commerce websites' overall attractiveness, also known under the term website appeal. Still, various studies offer separate insights on evaluating specific e-commerce criteria (Table 13).

Table 13. Assessment Approaches Related to (E-Commerce) Websites

Assessment Approach	***Description***	***Source***
SITEQUAL	*A tool for assessing the user's perception of an online store's quality based on ease of navigation, visual appeal, speed, security.*	*(Yoo & Donthu, 2001)*
Perceived Web Quality Index	*Scale to measure overall perceived website quality based on 25 items*	(Aladwani & Palvia, 2002)
E-SEQUAL	*A customer-centric model that incorporates perceived service quality dimensions for e-commerce design and assessment.*	*(Petre et al., 2006)*
B2C-adapted Microsoft Usability Guidelines (MUG)	*A website's appeal measured by five attributes: emotional response, content quality, ease of use, technology integration, and medium-specific content.*	*(X. Wang & Liu, 2007)*
Evaluation Guide for Websites	*An in-house evaluation tool for aligning web strategy with website implementation.*	*(Chiou et al., 2010)*
Website Content Assessment Survey	*A systematic website content description evaluation survey.*	*(Hasley & Gregg, 2010)*
Dual mediation-Hedonic-Utilitarian approach	*A cognitive and emotional attribute-based conceptual model for analyzing individual behavior in online environments.*	*(López & Ruiz, 2011)*
Quality Evaluation Model (QuEM)	*A website design evaluation based on six parameters: technical adequacy, usability, security, visual aspects, communication, and prestige.*	*(Cebi, 2013)*
Cube Assessment Framework	*An evaluation framework for B2C websites utilizing eight criteria: collaboration, connection, commerce, customization, content, community, communication,*	*(Hansen & Bjørn-Andersen, 2013)*

Web Quality Index (WQI)	*A comprehensive model for assessing website quality and suitability, incorporating technical, relational, communicative, and persuasive aspects.*	*(Fernández-Cavia et al., 2014)*
Measurement Index Common to Website and Store Images	*A measurement index based on ten channel dimensions of site and store image: offering, price, layout, accessibility, promotions, customer service, advice, reputation, institution, and connections with other channels*	*(Bèzes, 2014)*
Website Appeal Evaluation	*The appealing factors of e-commerce websites, including attractiveness, personal involvement, competitiveness, and customer retention, are comprehensively evaluated and organized into quadrants within a two-dimensional model.*	*(Abdallah & Jaleel, 2015)*

Author's elaboration, adapted and modified from Abdallah & Jaleel (2015, p. 49)

Among these website evaluation frameworks, SITEQUAL (Yoo & Donthu, 2001) offers options to assess the perceived quality of e-commerce websites, and it employs nine components, which are classified into four primary dimensions: aesthetic design, ease of use, processing speed, and security. Similarly, the perceived web quality scale by Aladwani and Palvia (2002) is an instrument that captures essential characteristics of website quality from the user's perspective, focusing on providing insights for website developers. It comprises four dimensions: appearance, content quality, technical adequacy, and specific content.

The evaluation schemes depicted in Table 13 are predominantly tailored to address specific issues and have been developed using diverse approaches. Although they enable comparability through the use of Likert scales, they lack the capacity to encompass a holistic comparison between websites through a compressing index. Additionally, these methods do not consider the sensory communication quality in the context of e-commerce websites. As part of this research, it is intended to shed more light on this particular aspect and to explore further if a new model (artifact) can be developed to address the DSR environment.

4.4.3.2. Indices related to Offline Sensory Marketing

Sensory marketing has become a powerful tool to capture consumers' attention and influence their behavior (Krishna, 2012). As a result, two related indices, the Sensory Perception Item Set (SPI) and the Implicit Sensory Association Test (ISAT), among others, have been developed, focusing on holistic approaches to sensory marketing. However, it is critical to note that the SPI and ISAT were not developed for the e-commerce sector but rather to comprehensively address sensory marketing. They focus on how consumers perceive sensory impressions across the human senses. The SPI, introduced by Haase and Wiedmann, includes 20 adjectives (four per sense) and are grouped as follows (2018, p. 735):

- Haptic Items: Well-shaped, Soothing, Handy, Comfortable
- Visual Items: Beautiful, Attractive, Aesthetic, Pretty
- Acoustic Items: Melodic, Sonorous, Good-Sounding, Euphonic
- Olfactory Items: Fragrant, Scented, Perfumed, Nice-Smelling
- Gustatory Items: Flavorful, Tasty, Appetizing, Palatable

The SPI is applicable to various products and industries due to its holistic nature and enables firms to gain insights into consumer preferences, influencing product design and brand communication (Haase & Wiedmann, 2018).

Introduced by the same authors, the ISAT recognizes the importance of consumers' implicit information processing for sensory marketing strategies (Haase & Wiedmann, 2020). Using a response latency-based approach, the ISAT measures implicit sensory understanding in all five sensory dimensions. This implicit understanding complements the explicit measurements obtained by the SPI and adds a new layer of insight into consumer behavior.

Although both indices are relevant to this work, they differ significantly from the DSR approach used in this study. Both indices were not primarily designed to assess specific content but rather serve as tools for understanding sensory perceptions more broadly. Nevertheless, their results, particularly the sensory keywords, are of great importance in written online (product) descriptions. Thus, this additional knowledge will be used throughout the NLP process in section 5.2.1.

4.4.3.3. ***Web Quality Index***

Fernández-Cavia et al. (2014) conducted a study focusing on the quality assessment of online platforms in the tourism sector. Their objective was to develop a model that marketing managers could use to evaluate tourism websites objectively. The study, published in "Tourism Management Perspectives," serves as a proposal similar to the current dissertation´s to-be-developed artifact, which aims to create a website evaluation model tailored explicitly to tourism. The researchers intended to explore if tourism websites provided users with necessary information, effectively utilized the internet's potential, and convinced visitors to choose the presented destination. The evaluation methodology includes various parameters such as user-friendliness, ease of use, interactivity, and information structure. Information structure refers to the organization and presentation of information on a website to facilitate easy access. In addition to providing information about a destination, tourism websites aim to persuade potential visitors to choose that destination. The researchers highlighted the importance of text and images in conveying the destination's unique features and offerings. The initial impression of users was identified as critical during the online information search process. Discourse analysis was employed to measure the persuasive power of websites through argumentatively designed images and texts. The researchers also considered interactivity, assuming a bidirectional communication relationship between users and website content. Mobile communication was also examined, especially website adaptation for smartphones and tablets.

To compile the parameters for evaluating tourism websites, the authors reviewed existing literature and summarized them in a tabular model. The assessment methodology relies on an analysis template of indicators for twelve parameters representing different dimensions. The depth of examination for each indicator is indicated by a letter code, specifying whether it should be searched for on every sub-page or only on the landing page. For instance, the optional language selection is essential for the landing page. If the language option is not found at this point, there is no further search for it on the sub-pages.

The assessment methodology combines quantitative and qualitative data to evaluate websites comprehensively. The weighting of each indicator is determined by discussion and negotiation among the research team's experts, considering the

indicator's significance within the respective parameter and the range of its scale. The closer the score is to 1, the more satisfyingly the website aligns with the identified characteristics in the analysis. Higher scores indicate alignment with identified website characteristics, while lower scores highlight shortcomings. A pilot test involved ten tourism websites from Spanish and other European destinations to validate the methodology.

The Web Quality Index (WQI) provides an overall measure of the website's quality, considering multiple aspects and perspectives. Finally, it represents the developmental level of a destination website but does not explicitly address individual parameters or indicate which areas excel or fall below average. Despite the abundance of diverse information, the WQI represents a straightforward evaluation measure for overall website quality for tourism websites. This study serves as the foundation for the subsequent evaluation model, which will be adapted to incorporate multisensory consumer approaches on e-commerce websites by providing a detailed explanation of the methodology used to identify parameters, operationalize them through indicators, and calculate an overarching value, specifically tailored to multisensory aspects.

4.4.4. Discussion

This related work chapter aims to provide an answer to RQ3, which seeks to explore the feasibility of incorporating the dissertation´s scope into the existing body of academic literature. To achieve this, the topics directly related to this dissertation, identified during the SLR, were explored in depth. These topics include (online) sensory marketing and consumer behavior (Topic 1), product touch (Topic 4), and sensory retail experience (Topic 6). Subsequently, the focus shifted to sensory marketing AI assessments and related indices, but these articles currently still lack an intersection with online sensory marketing and its evaluation.

The analyses have a common output: this dissertation leverages the existing knowledge of sensory insights, index creation methods (especially the WQI), and AI applications explored and presented in this section to create a novel DSR artifact. Consequently, RQ3 can be answered in the sense that the existing literature forms the basis for the artifact, yet this work does not exhibit redundancies in any of these areas, underscoring its uniqueness and distinguishing itself from existing concepts.

4.5. B2C PERSPECTIVE ON SENSORY MARKETING

The objective of this section is to verify the significance of the potential sensory e-commerce indicators identified through systematic literature reviews and semi-structured interviews from the B2C standpoint. To achieve this, exploratory factor analysis (EFA) is conducted based on a survey, and the results are compared with a second survey using confirmatory factor analysis. Subsequently, this analysis is followed by RQ4b, which aims to explore the importance of online sensory elements from a consumer perspective and the extent to which they are valued. This two-way perspective between B2B and B2C will contribute to developing the DSR artifact to be conducted in chapter V, the implementation phase.

4.5.1. Preparation and Testing of Initial Item Questionnaire

In preparation for conducting an online survey to statistically validate the B2C perspective regarding sensory items for an assessment tool, an initial item pool was compiled from the SSIs and the SLR. The initial item pool comprised 63 items derived from the gathered content elements in Table 14. Subsequently, experts critically reviewed these items for their content relevance, linguistic accuracy, completeness, and redundancy. Two experts in sensory marketing, IP1, and IP4 (see section 4.2.1.4), evaluated the item pool independently, resulting in a preliminary reduced item pool containing 43 items. Additionally, due to specific query considerations, it was suggested that examples (e.g., sensory keywords per sense) need to be included alongside respective items.

Furthermore, three independent individuals associated with the author were asked to review the initial item questionnaire for comprehension and linguistic correctness. Minor adjustments were made, particularly in phrasing, to enhance a rapid question understanding. Appendix 3 contains the initially derived item pool.

The initial item pool primarily focuses on the content perspective, which was emphasized by the experts. This includes sensory texts, images, audio content, video content, and interactive media on e-commerce websites. Considering the insights derived from the expert interviews and the existing scientific literature, it can be postulated that meticulous consideration of even the most minute sensory

criteria is essential for effectively engaging the consumer's senses (Baltezarevic, 2023). For instance, Javornik (2016) highlighted that presenting a brand's visual representation (in 2D or 3D) against a neutral background fails to evoke the impression of how the product would appear or feel in a real-life context. Additionally, Rose et al. (2012) stated that online customers encounter various types of sensory information while browsing e-commerce websites, including text, visual imagery, videos, and audio. According to the findings of Gentile et al. (2007), customers process sensory information based on their cognitive and emotional responses, forming impressions about the online retailer's website.

Table 14. Item Pool derived from SLR and SSIs

Dimension	***Sample Items***
Haptics	*Text-based haptic imagery; endowment effect; 2D images; images showing the dimensions of the product; 3D product visualization; product video (moving images); virtual try-on (VTO); representation of interpersonal touches; brand; online forum; positive mood; recommendation agents; interactive chat with employees; discounts (price promotion)*
Olfaction	*Text-based olfactory imagery; imaged-based olfactory imagery*
Acoustics	*Text-based acoustic imagery; imaged-based acoustic imagery; sounds / music (e.g., in connection with surfaces and forms); perceived sounds about lived words; speaker / voice*
Gustation	*Text-based gustatory imagery; imaged-based gustatory imagery; use of color schemes; adjustment / design of the brand-name /product name; typography of the product description; product look (incl. packaging) and surfaces*
Vision	*Text-based visual imagery; coloring of web page; key frames (images); dynamic images; mood video; contrast of images / web page; surface (gloss vs. matt); handwritten information; customer star ratings*

However, the level of sensory detail may vary depending on the type, which is why there are relatively more text-based items in the item pool. These items cover sensory keywords, narrative descriptions, or even active textual prompts encouraging website visitors to evoke sensory imagination (see section 1.3.3). Similarly, various components of image materials are considered in the pool, confirming differences in the sensory communication quality of images, such as a preference for so-called feature crops and the positive haptic effect of super-zoom images (Bleier et al., 2019). The dynamics in images are of visual significance, too.

In addition, the items also encompass different forms of dynamic and interactive sensory content (Ceylan et al., 2023), including elements like 3D content and virtual try-ons, addressing the growing trend of augmented reality (AR).

The sensory items are measured according to common scientific research practice on a seven-point scale ranging from (1) "extremely not important" to (7) "extremely important (Aladwani & Palvia, 2002). However, it is essential to note that the pool of sensory items is initially organized according to the senses. Thus, each item is assigned an abbreviation based on the respective sensory concept (e.g., H -> Haptics, A -> Acoustics, etc.). However, this categorization does not necessarily need to be maintained, as it only reflects an a priori assumption, particularly based on existing sensory literature. The subsequent exploratory factor analysis remains open to results. It does not presuppose that these items will necessarily represent reflective routes to human senses but might manifest in divergent ways if factor extraction is feasible.

4.5.2. Exploratory Factor Analysis

The exploratory factor analysis (EFA) is a data exploration technique from the toolkit of multivariate statistics. Therefore, this method was chosen to assess sensory elements and determine if there are patterns in the collected data that allow for meaningful factorization. To pursue this objective, specifically addressing RQ4b, the following steps of data collection through an online survey are described, as well as the screening and data cleaning processes prior to the actual analysis. Lastly, the results of the EFA are presented.

4.5.2.1. EFA-Survey Data Retrieval

To reach a highly heterogeneous group of end consumers for the survey, conducting a broad and diverse range of inquiries is necessary. Therefore, the data collection utilized Amazon´s Mturk Application, which has gained popularity in the scientific literature, particularly among high-quality journals (A+) (Bleier et al., 2019; J. K. Goodman & Paolacci, 2017). This platform functions as a crowdsourcing platform, where users, known as Mturk workers, perform human intelligence tasks (HITs) and receive compensation from the requester (Horton & Chilton, 2010). As a result, large amounts of data can be generated quickly and conveniently (Paolacci et al., 2010). However, the suitability of Mturk for academic research has been subject to different evaluations. As noted by Goodman (2017), there are partly concerns that Mturk workers may not provide reliable data and may not be representative of real-world consumers. This criticism is not unique to crowdsourcing research but has been similarly raised for decades regarding the use of college students in consumer research lab situations (Calder et al., 1981, 1982, 1983; Ferber, 1977; Peterson, 2001; Petty & Cacioppo, 1996; Wells, 1993).

Several studies have examined crowdsourcing platforms and established guidelines for their effective use (M. Buhrmester et al., 2011; M. D. Buhrmester et al., 2018; Robinson et al., 2019; Sprouse, 2011). This study adheres to these standards by requiring a HIT-approval rate of 95% and at least 100 approved HITs, representing solid and reliable workers. Additionally, a compensation of .50 USD was chosen based on an approximate survey completion time of 6-8 minutes, which is approximately equivalent to the mean hourly wage of microtasks, amounting to 5.55 USD (Aguinis et al., 2021; Hornuf & Vrankar, 2022). Furthermore, previously conducted investigations suggest that the data quality is not significantly influenced by the amount paid per HIT (M. Buhrmester et al., 2011; Mason & Watts, 2009). Thus, the compensation applied in this study can be considered appropriate.

A total of 409 participants were recruited to answer the online sensory survey using an online survey tool. While there are no definitive recommendations in the literature regarding the sample size for this type of study (Henson & Roberts, 2006), some scholars such as Comrey and Lee (1992), Tabachnick and Fidell (1996), and Hair et al. (2013) recommend that a plausible EFA can be conducted with a sample size of at least 300 survey participants.

4.5.2.2. EFA-Survey Data Screening

Irrespective of the data collection method, a rigorous data screening process must be conducted before performing an exploratory factor analysis (EFA). Data validation was carried out following the guidelines outlined by Lünich (2022). Initially, a screen-out was performed based on response time. A cut-off point of four minutes or less (approximately 50% of the allocated time) was set to exclude participants. This led to the exclusion of 16 subjects.

Additionally, a manual screening was performed to identify response patterns (e.g., 7, 6, 7, 6) and to detect obvious "click-through" responders who consistently provided the same response regardless of the value on the Likert scale. A threshold of 90% agreement was used for the screen-out, meaning that participants with ≥ 39 identical responses (out of 43 total items from the questionnaire) were excluded, resulting in the removal of 22 additional subjects.

A screen-out based on attention checks was implemented as the final screen-out check. To assess the seriousness of responses and participants' attentiveness while completing the questionnaire, the age was collected as free text at the beginning, and the birth year was queried at the end of the questionnaire. When comparing the two responses, a tolerance range of -2 to +2 years was used to account for possible inadvertent number reversals or erroneous entries. Through Excel calculations, additional 13 participants were excluded.

In total, the original dataset was cleansed of 51 participants, representing a reduction of 12.47% (from 409 to 358 participants) through the strict application of these three screening procedures.

4.5.2.3. EFA Results

After conducting the data screening, the exploratory factor analysis was performed using SPSS version 29. Before proceeding with the factor output, it is advisable to assess the data quality and determine its suitability for the analysis (Williams et al., 2010). The Kaiser-Meyer-Olkin (KMO) criterion (Kaiser & Rice, 1974) and Bartlett's (1950) Test of Sphericity are appropriate statistical measures for this purpose. The KMO value obtained in the current study was .94, indicating that the data is highly suitable for factor analysis (Churchill, 1979; Hair et al., 2013). Additionally, Bartlett's Test of Sphericity yielded significant results (Chi-Square =

9556.90, df = 666, Significance = .001), indicating that the correlation matrix is significantly different from an identity matrix, supporting the suitability of the data for factor analysis (Bartlett, 1950; Tabachnick & Fidell, 1996).

To further assess the suitability of the individual items for the factor analysis, anti-image correlations were examined, and the Measure of Sampling Adequacy (MSA) values were calculated. The MSA values, which indicate how strongly each item correlates with other items, were found to be greater than .90 for all items in the dataset, demonstrating their adequacy for the factor analysis (Hair et al., 2013).

Overall, the dataset appears to be well-suited for conducting the exploratory factor analysis, and as a next step, the extraction method needs to be chosen. The decision on the extraction method and rotation procedure has been extensively discussed (Fabrigar et al., 1999). For this study, the maximum likelihood method was chosen, with Promax selected for oblique rotation. Promax fits the assumption that there could be correlations between factors concerning sensory elements and their significance in the digital context (Abdallah & Jaleel, 2015).

The next step involved determining the number of factors to extract, following an iterative process. Initially, the Kaiser criterion was examined, meeting the cut-off that only factors with eigenvalues greater than one ($\lambda > 1$) should be extracted. However, the Kaiser criterion often overestimates the number of significant factors. This case resulted in a factor structure with six dimensions, explaining 59.97% of the cumulative variance of squared factor loadings. It became evident that factors five and six were significantly less important than the first four factors. Moreover, the communalities of A7, V10, and V12 indicated that they did not fit the exploratory factor solution, as their values were far below .50. Communalities represent the proportion of the total variance of a variable that can be explained by all factors together.

Consequently, the scree plot was also investigated as a decision criterion (see Appendix 4). Although not entirely definitive, it indicates that six factors are too many. As a result, another factor analysis was performed with a 4-factor solution. The 4-factor model revealed that only 56.54 % of the cumulative variance could be explained. Additionally, the residuals between observed and reproduced correlations were too high, with 65 (7%) being non-redundant residuals with absolute values greater than .05. As a result, A7 was removed initially as it did not

load on any factor due to a factor loading below .30. Subsequently, A8, V9, and V12 were also removed as all factor loadings load on factor three but do not surpass the threshold of .50, which is considered the cut-off for factor loadings in this study (Soyoung Kim & Stoel, 2004; Wolfinbarger & Gilly, 2003), although other sources consider lower cut-off values as acceptable (Cristobal et al., 2007; Loiacono et al., 2002), depending on the individual intention of the study carried out (Hair et al., 2013). In further refinement steps, items A9 and V10 were deleted due to their similar insufficient factor loadings. The final 4-factor model, as additionally indicated by a revised scree plot (see Appendix 4), exhibits a structure matrix as revealed in Table 15 below, with the highest factor-related loadings marked in blue.

Table 15. Structure Matrix Exploratory Factor Analysis

Structure Matrix Exploratory Factor Analysis					
No.	***Item***	*Factors*			
		1	*2*	*3*	*4*
1	*H1*	*.82*	*.13*	*.19*	*.13*
2	*O1*	*.82*	*.13*	*.25*	*.10*
3	*G1*	*.82*	*.18*	*.24*	*.11*
4	*H3*	*.80*	*.20*	*.19*	*.13*
5	*V5*	*.80*	*.15*	*.20*	*.13*
6	*V1*	*.79*	*.19*	*.16*	*.10*
7	*A1*	*.79*	*.16*	*.23*	*.07*
8	*V7*	*.78*	*.19*	*.18*	*.09*
9	*V3*	*.77*	*.16*	*.21*	*.06*
10	*V11*	*.77*	*.14*	*.17*	*.11*
11	*G5*	*.75*	*.19*	*.21*	*.10*
12	*O3*	*.74*	*.19*	*.20*	*.11*
13	*A3*	*.74*	*.19*	*.18*	*.07*
14	*G3*	*.73*	*.14*	*.21*	*.10*
15	*O2*	*.11*	*.83*	*.13*	*.10*

Structure Matrix Exploratory Factor Analysis					
No.	***Item***	*Factors*			
16	*V4*	*.17*	*.80*	*.10*	*.04*
17	*A2*	*.19*	*.80*	*.22*	*.15*
18	*A10*	*.18*	*.78*	*.20*	*.14*
19	*G4*	*.22*	*.78*	*.24*	*.17*
20	*V8*	*.15*	*.77*	*.08*	*.07*
21	*G2*	*.11*	*.77*	*.22*	*.15*
22	*V2*	*.18*	*.77*	*.12*	*.18*
23	*H2*	*.09*	*.76*	*.11*	*.10*
24	*O4*	*.15*	*.75*	*.22*	*.14*
25	*A4*	*.19*	*.74*	*.12*	*.08*
26	*A6*	*.21*	*.74*	*.15*	*.13*
27	*G6*	*.21*	*.73*	*.15*	*.10*
28	*H13*	*.21*	*.14*	*.83*	*.17*
29	*H16*	*.16*	*.13*	*.83*	*.17*
30	*H7*	*.23*	*.16*	*.80*	*.22*
31	*H11*	*.24*	*.22*	*.79*	*.18*
32	*H9*	*.22*	*.18*	*.78*	*.24*
33	*H10*	*.07*	*.12*	*.21*	*.82*
34	*H8*	*.11*	*.11*	*.19*	*.81*
35	*H12*	*.10*	*.13*	*.17*	*.81*
36	*H14*	*.05*	*.16*	*.20*	*.79*
37	*H15*	*.19*	*.09*	*.19*	*.79*
	Extraction method: Maximum Likelihood. *Rotation method: Promax with Kaiser normalization.* *The rotation is converged in 5 iterations.* *All variables are rounded to two decimal places.*				

The EFA´s statistical measures, including the Chi-Square value of 912.53 with 524 degrees of freedom and a significance level of .000, indicated a satisfying fit of the model to the data. Each factor demonstrated satisfying eigenvalues, with factor one having 10.54 (explaining 28.48% of the variance), factor two with 6.38 (17.24%), factor three with 3.50 (9.49%), and factor four with 2.40 (6.58%). The cumulative variance explained by the 4-factor model amounted to a notable value of 61.75 %, signifying a considerable proportion of the data's variability effectively captured by the identified factors. The factors´ internal consistency was also strong, as indicated by high Cronbach's alpha values: .96 for factor one, .95 for factor two, and .90 (factors three and four). These results support the item´s reliability within each factor as indicators of the respective underlying constructs (Hair et al., 2013).

Moreover, the presence of only 34 non-redundant residuals with absolute values greater than .05 underscored the model's effectiveness in accounting for the interrelationships among variables, representing an acceptable proportion (5%). The factor intercorrelations, ranging from .13 to .26, exhibited relatively low values, providing evidence of the distinctiveness among the factors and supporting their discriminant validity.

Next, naming the identified factors and assigning them to themes is a subjective and inductive, consequently epistemic, process led by the researcher (Stacey, 1953). Due to this, the validity of the factors and all frameworks developed with them is largely determined by the suitability of the factors defined by the researcher (Abdallah & Jaleel, 2015; Henson & Roberts, 2006). Therefore, they are defined as follows, emphasizing their intersections from a content perspective:

- (1) Multisensory Immersion:

  This factor pertains to items 1-14 (see Table 15), describing how the use of language and pictorial representations on a website can help users form a clear impression of a product's sensory characteristics (e.g., touch, taste).
- (2) Sensory Atmospheric Imagination:

  This factor comprises the items 15-27. These items deal with how narrative descriptions, mood images, music, and dynamic visual elements on a website can contribute to users forming an understanding of the visual and

auditory properties of a product. Unlike Factor 1, this factor is about staging a comprehensive experience that appeals to multiple senses.

- (3) Sensory Product Information Visualization:

  Factor three relates to items 28-32 and describes how various forms of primarily automated visualizations, such as augmented reality, 3D visualizations, and images with I perspective, enable users to form a clear mental representation of what it would be like to touch and experience the product. It pertains to the visual representation of information and product details, which stimulate haptic imagination.

- (4) Sensory Interactive Product Information:

  The fourth factor, consisting of the remaining items 33-37, deals with diverse content types of product information, including interactive 3D visualizations, self-locating AR, and explanatory product videos, which aid users in forming a vivid mental picture of what it would be like to touch and experience the product. It concentrates on the effective presentation of the product itself and its impact on an interactive online sensory experience.

4.5.3. Confirmatory Factor Analysis

To verify the previously obtained four-factor solution from the EFA, an independent second study was conducted using Mturk. The data collection conditions were identical to the previous study, except that, for additional consistency, the survey was exclusively targeted to US participants this time. Data screening and dataset cleansing, however, followed the same conditions as previously. The second study initially included 400 datasets, which were reduced to 375 after applying the cleansing steps. Subsequently, a confirmatory factor analysis (CFA) was conducted using SPSS AMOS version 26.

The CFA revealed satisfactory model fit indices common in scientific research (Hair et al., 2013). One of the first indices to assess is the Chi-Square test (CMIN), which yields a value of 1182.82 with 623 degrees of freedom (DF), resulting in a significant p-value ($p<.001$), which can be attributed to the considerable sample size. Notwithstanding the high Chi-Square value, the normed Chi-Square value (CMIN/DF) of 1.89 suggests that the model effectively approximates the data

obtained. In addition, the Comparative Fit Index (CFI) demonstrates a value of .943. This CFI value represents that the model displays a favorable fit and explains approximately 94.3% of the variance in the data, indicating robust construct validity. Moreover, the Tucker-Lewis Index (TLI) uncovers a value of .939 that corroborates the model's fit, with a satisfactory improvement of nearly 94% compared to the null model. Furthermore, the Root Mean Square Error of Approximation (RMSEA) achieves a value of .049, a proximity to 0, which signifies a strong fit, with the model's predicted covariances closely matching the observed data. The Parsimony Comparative Fit Index (PCFI) of .88 shows that the model effectively explains the data and outperforms the null model (Hu & Bentler, 1999).

Next, the CFA results depicted in Table 16 below will be discussed in detail.

Table 16. Confirmatory Factor Analysis

Confirmatory Factor Analysis								
Factors		*Validity Measures*			*Factor Loadings*			
Name	*Item*	*CR*	*MSV*	*AVE*	*1*	*2*	*3*	*4*
(1) Multisensory Immersion	*H1*	*.96*	*.08*	*.62*	*.80*			
	O1				*.84*			
	G1				*.83*			
	V5				*.80*			
	H3				*.81*			
	V1				*.80*			
	A1				*.81*			
	V11				*.75*			
	V7				*.78*			
	V3				*.78*			
	G5				*.75*			
	A3				*.76*			
	O3				*.76*			
	G3				*.72*			

Confirmatory Factor Analysis								
Factors		*Validity Measures*			*Factor Loadings*			
Name	*Item*	*CR*	*MSV*	*AVE*	*1*	*2*	*3*	*4*
(2) Sensory Atmospheric Imagination	*O2*	*.95*	*.03*	*.59*		*.84*		
	V4					*.77*		
	V8					*.73*		
	A2					*.82*		
	H2					*.73*		
	A10					*.79*		
	G2					*.81*		
	V2					*.72*		
	G4					*.76*		
	A4					*.76*		
	O4					*.78*		
	A6					*.76*		
	G6					*.72*		
(3) Sensory Prod. Info Visualization	*H16*	*.89*	*.08*	*.64*			*.81*	
	H13						*.84*	
	H7						*.77*	
	H11						*.80*	
	H9						*.77*	
(4) Sensory Inter. Prod. Info	*H10*	*.90*	*.04*	*.64*				*.80*
	H8							*.82*
	H12							*.82*
	H15							*.78*
	H14							*.80*
Note: CR, Composite Reliability; MSV, Mean Squared Variance; AVE, Average Variance Extracted;								

In addition to the goodness-of-fit indices, an examination of the factors in the CFA revealed that they generally exhibit similar factor loadings to the EFA, each exceeding .50, thereby indicating satisfactory performance (Bagozzi & Yi, 1988). Outliers or significantly strong cross-loadings are absent.

Furthermore, the Composite Reliability (CR) values for all factors surpass .90. These CR values confirm the internal consistency and reliability of the measurement model. The Average Variance Extracted (AVE) figures for each factor surpass the lower threshold of .50, signifying that more than 50% of the variance in the observed indicators is accounted for by the underlying latent constructs, causing adequate convergent validity of the factor model (Fornell & Larcker, 1981). Additionally, the Maximum Shared Variance (MSV) is relatively low for all factors, suggesting limited overlap or redundancy among the factors, hence confirming discriminant validity (Bentler & Bonett, 1980).

As introduced by Henseler et al. (2015), the HTMT analysis is an additional analytical tool employed to assess discriminant validity (see section 3.6). The results based on the CFA figures are presented in Table 17. The HTMT analysis is used to pursue validity measures by examining the extent to which the AVE′s square root for each factor is greater than the correlations between that factor and other factors. For discriminant validity to be established, the HTMT ratios should be less than 1, despite the diagonal elements that represent the comparison of each factor with itself. The off-diagonal elements represent the inter-factor comparisons.

Table 17. HTMT Analysis

Factors	***(1)***	***(2)***	***(3)***	***(4)***
(1) Multisensory Immersion				
(2) Sensory Atmospheric Imagination	*.19*			
(3) Sensory Product. Information Visualization	*.29*	*.10*		
(4) Sensory Interactive Product Information	*.12*	*.07*	*.21*	

Since all HTMT ratios are clearly below one, with the highest value at .29 between factors one and three, this indicates that the discriminant validity is supported between the four factors (Henseler et al., 2015). The results suggest that each factor is sufficiently distinct from one another.

4.5.4. Discussion

This chapter focused on conducting statistical methods of factor analysis to examine the significance of sensory elements in the e-commerce domain from a B2C perspective. Initially, an exploratory factor analysis was performed based on the collected survey data, revealing a four-factor model as an adequate solution that was supported by an additional confirmatory factor analysis with another survey. However, it should be noted that EFAs inherently have subjective components (Williams et al., 2010). As pointed out by Tabachnick and Fidell (1996), they come with limitations concerning the pragmatic decisions made regarding rotation methods and the number and interpretation of factors by the researcher.

Despite these methodological concerns, the exploratory and confirmatory factor analysis approach provides insights into essential elements regarding sensory e-commerce communication. Nevertheless, the objective was not to develop a comprehensive scale. Doing so would require additional surveys in different contexts to ensure that the identified factors hold across various methods. Indeed, it cannot be entirely ruled out that the results are consistent across numerous measurements, necessitating further investigations. However, these are beyond the scope of this dissertation due to limited resources.

Instead, the primary goal of this work related to the B2C perspective was to confirm relevant sensory items derived from the SSIs and the SLR that could be included in a hypothetical index. Consequently, the proposed assessment model will maintain the sensory human structure as it serves as a proposal for a measurement instrument where weighting the senses holds significant importance. The dimensional structure derived from the EFA does not logically enable the inclusion of weighting in a meaningful manner because these factors are not organized according to human senses. Nonetheless, the items and factors identified as relevant from the two B2C surveys in this chapter will be integrated next as foundational elements of the artifact to be developed for digital sensory evaluation.

V – IMPLEMENTATION

V - IMPLEMENTATION

After identifying the environmental factors and the knowledge base through semi-structured expert interviews and a comprehensive systematic literature review, including STIRL, the dissertation now discusses the implementation phase. This chapter is divided into three sections. Firstly, in section 5.1, the findings from the semi-structured interviews, systematic literature review, and B2C survey are utilized to develop a manual sensory evaluation framework designated as Artifact I. Next, in section 5.2, machine-based sensory evaluations are conducted for each type of sensory content, and their suitability is assessed to potentially integrate into an automated evaluation tool. Lastly, in section 5.3, a mock-up is created within the context of the Design Science Research framework, following the approach outlined by Hevner et al. (2004), by applying the insights obtained from sections 5.1 and 5.2. This mock-up serves as an illustrative demonstration of the results, to be later presented to the relevant stakeholders as a proposed solution addressing the identified business need of assessing sensory e-commerce content.

5.1. ARTIFACT I DEVELOPMENT

This chapter focuses on the development of a manual assessment approach for measuring and evaluating sensory online content in the e-commerce domain.

5.1.1. Online Sensory Marketing Index Development (Artifact I)

The idea for the subsequent assessment was initially introduced in the author's unpublished master's thesis but has since undergone extensive revisions. Therefore, Artifact I represents a new approach based on the new insights gained from this work, including implementing a purified version and incorporating weighting, which were not included in the preliminary idea. Furthermore, an early version of the Online Sensory Measurement Index (OSMI) has been published by Hamacher and Buchkremer (2022a) in the Journal of Theoretical and Applied Electronic Commerce Research (JTAER) prior to conducting the B2C perspective in

section 4.5 with EFA/CFA. As a result, certain sections in this chapter have been revised based on the updated information from that publication.

5.1.1.1. ***OSMI Parameters***

The sensory parameters for building the sensory marketing e-commerce assessment methodology are presented and explained in more detail below based on the research findings derived from the expert interviews and the statistical analyses from section 4.5. Consequently, the parameters are still based on the senses without aiming at reflective measurement. Thus, five parameters are defined, which are to be examined with different indicators, as shown in Table 18:

Table 18. Overview of OSMI Parameters

Parameter	*Number of Indicators*	*Abbreviation*
Haptics	*6*	*H1 – H6*
Olfaction	*2*	*O1 – O2*
Acoustics	*4*	*A1 – A4*
Gustation	*4*	*G1 – G4*
Vision	*5*	*V1 – V5*

5.1.1.2. ***OSMI Indicators***

Table 18 adopts a consistent structure for all tables, featuring abbreviations (e.g., H for haptics) and potential numerical values for each indicator in the left column. Detailed descriptions of these options are provided in the middle column of the indices. Similar to Fernández-Cavia et al.'s study (2014), the OSMI incorporates indicators that utilize various scales. A scale of 0-1 is used when indicating the presence or absence of a specific indicator. Conversely, if more objective assessments can be made about the quality of the sensory characteristic, a scale of 0-2 or 0-3 is employed. For instance, Weak (0), Standard (1), Good (2), Excellent (3). The development of these indicators, listed in Table 19 is based on peer-reviewed journals with appropriate validations (references are included) and

additionally investigated by the conducted SSIs as well as the exploratory and confirmatory B2C approach (see section 4.5).

Text-based indicators serve as the foundation for assessing the OSMI parameters. The utilization of sensory information in a storytelling format can be particularly effective. Elder and Krishna (2012) demonstrated that advertising texts and product descriptions can enhance the product experience if they are designed to be sensually congruent. It is advantageous to use active verbs instead of nouns, as stated by Raposo et al. (2009, p. 395), who noted that *"Action words appear to activate motor regions only when they occur in isolation or in sentences that emphasize body movements."* Thus, within the OSMI framework, the notion is included that sensory influence can occur indirectly through the use of active verbs or sentences formulated with a sensory focus. Additionally, McCabe and Nowlis (2003) found that product descriptions and advertising messages are perceived more strongly when accompanied by visual illustrations of the sensory experience. Indirect formulations, such as *"The taste of this freshly brewed coffee in the morning is a pleasure for every palate,"* evoke sensory imagination and can enhance product perception and purchase intention. Conversely, a direct request that explicitly asks the reader to imagine the taste is considered even more effective and is assigned the highest evaluation level (3). A freely thought-out example of this type of formulation could be, *"Imagine how the freshly brewed coffee touches your palate in the morning, allowing you to savor the fine roasted aromas."*

The OSMI evaluation also incorporates (2D) images alongside sensory texts. Although images are commonly used in e-commerce, their quality in terms of resolution and content can vary significantly. However, high-resolution images and the presentation of products from different angles, including (2D) superzoom images, can significantly influence purchase intention. On the other hand, 3D images or animations create interactivity by enabling consumers to zoom in on every angle of the product and rotate it, resulting in more vivid visualizations of product usage. This, in turn, leads to higher purchase intentions compared to when the same information is presented statically. Furthermore, including a virtual try-on (H6) can reduce perceived product risk and enhance the entertainment value of online customer experiences.

Table 19. Overview of the Online Sensory Marketing Index

	Indicator	(0) Weak	(1) Standard	(2) Good	(3) Excellent	References
Haptics	H1 0-3 **Text-based haptic imagery**	Not present	Sensory-matching keywords available	Indirect formulations	Written request	(Bower, 2004; Chang, 2013; Peck et al., 2013; Raposo et al., 2009; Silva et al., 2021)
	H2 0-3 **2D images**	Not present, or small images	Super zoom images (feature crops)	Images from different angles	Use 1-perspective	(Elder & Krishna, 2012; J. Park et al., 2005)
	H3 0-1 **Dimensional product visuals**	Not present	Available			((Elder & Krishna, 2012; Jha et al., 2023)
	H4 0-3 **3D product visualization**	Not present	Available	Rotating product presentation (automatically)	Interactive product rotation online	(Choi & Taylor, 2014; J. Kim & Forsythe, 2008a, 2008b; Seeun Kim et al., 2020; H. Li et al., 2002; Nah et al., 2011; J. Park et
	H5 0-2 **Product video (moving images)**	Not present	Product in action	Product in action and explained by a spokesperson		(Roggeveen et al., 2015; Sanmartín et al., 2017)
	H6 0-3 **Virtual try-on (VTO)**	Not present	Available	VR/AR including self-location	Personalized VR/AR	(Cho & Schwarz, 2012; J. Kim & Forsythe, 2008a; Merle et al., 2012)
Acoustics	A1 0-3 **Text-based acoustic imagery**	Not present	Sensory-matching keywords available	Indirect formulations	Written request	(Bower, 2004; Rao Unnava et al., 1996)
	A2 0-1 **Image-based acoustic imagery**	Not present	Mood image evoking acoustic imagery			
	A3 0-2 **Sounds / Music**	No acoustics available	Acoustics available	Sensory-matched music		(Spence et al., 2016)
	A4 0-2 **Speaker / Voice**	No speaker / voice integrated	Speaker / voice integrated	Speaker / voice congruently matched to the senses and spreads a positive mood		(K. Stewart & Koh, 2017; M. A. Stewart & Ryan, 1982)

		Indicator	(0) Weak	(1) Standard	(2) Good	(3) Excellent	References
Gustation	G1 0-3	Text-based gustatory imagery	Not present	Sensory-matching keywords available	Indirect formulations	Written request	(Elder & Krishna, 2010; Goili et al., 2017; Krishna et al., 2016)
	G2 0-1	Image-based gustatory imagery	Not present	Mood image evoking gustatory imagery			
	G3 0-1	Use of color schemes	Black, white or too many mixed colors	One color sensually congruently applied			(Spence et al., 2015; Spence & Levitan, 2021; Woods et al., 2016)
	G4 0-1	Adjustment / Design of the brand-name / Product name	Lack of sensory match in brand /product name	Product category and name of the brand or product sensually matched			(Spence, 2012)
Visuality	V1 0-3	Text-based visual imagery	Not present	Sensory-matching keywords available	Indirect formulations	Written request	(Elder & Krishna, 2010)
	V2 0-3	Coloring of web page	Not tuned	Adapted to the product	Matching product & brand		(Semin & Palma, 2014; Siburyte & Skeryte, 2014)
	V3 0-1	Key frames (images)	Not present	Available			(Elder & Krishna, 2012)
	V4 0-1	Dynamic images	Not present	Available			(Cian et al., 2014; Roggeveen et al., 2015)
	V5 0-1	Contrast of images / web page	Not tuned	Strong contrast			(Reynolds-McIlnay et al., 2017)
Olfaction	O1 0-3	Text-based olfactory imagery	Not present	Sensory-matching keywords available	Indirect formulations	Written request	(González et al., 2006; Krishna et al., 2014; M. H. (Jenny) Lin et al., 2018)
	O2 0-1	Image-based olfactory imagery	Not present	Mood image evoking olfactory imagery			

5.1.1.3. OSMI Weighting

Evaluating the sensory appeal of e-commerce websites necessitates the operationalization of content to facilitate quantitative measurement, employing a standardized scale ranging from zero to one. Subsequently, indicators undergo weighting, and each is assigned a relative weight based on its significance within the analyzed parameter. Moreover, consideration of higher-level parameter weighting is also plausible in this context. Such value weighting is predominantly achieved through discussion and negotiation. Fernández-Cavia et al. (2014) propose the inclusion of expert opinions within the research team, along with exploring existing literature, considering the indicator's relevance and scale extent.

Regarding the OSMI, Petit et al. (2019) highlight that the influence of sensory marketing on online consumer behavior extends beyond the limitations of physical environments, occurring through distinct channels. Scientific studies have suggested that specific parameters, like haptics, should generally receive a weighting of two or higher (M. A. Heller & Clark, 2012). However, the importance of touch varies among individuals, depending on factors such as NFT (Need for Touch) and the product category (Peck & Childers, 2003a, 2003b). Consequently, a nuanced analysis requires sensory weighting to account for these additional dimensions. To facilitate differentiated analysis, Kilian's (2010) specified industries, including vehicles, electronics, households, furnishings, fashion, office supplies, hygiene, food, and service industries, were adopted. This list of industries can be expanded with ease. Different senses are evaluated for relevance using a rating scale from one to five. A rating of one indicates insignificance in addressing the corresponding sense, whereas a rating of five signifies utmost importance in the industry. Ratings below one are deliberately omitted, considering that supposedly insignificant senses can influence other senses or fundamentally improve the well-being of consumers.

As a result, a gradation of senses is established, wherein directly addressed sensory modalities in a particular industry receive the highest rating, and accompanying sensory perceptions are rated based on the strength of their influence. By appending the weighting of the five sensory modalities and following the calculation of the OSMI, a distribution of ratings by industry is presented in Table 20. As indicated by Kilian (2010), the overview demonstrates that three to

four sensory modalities are of medium to high importance in nearly every industry, thus highlighting the significance of multisensory consumer appeal.

Visual perception plays a vital role across all industries, whereas taste holds paramount importance solely in the food sector. In other industries, gustatory cues may primarily enhance well-being or evoke memories. Conversely, haptics holds at least moderate importance across all industries, especially relevant for conducting haptic quality checks in fashion, furnishings, and electronics. Whether envisioning the texture of a sweater or experiencing the weight and comfort of holding a smartphone, haptic perception remains omnipresent in these domains.

Table 20. Sensory Weighting per Industry Offline and Online

		Imagery (-40 %)					
Industry / Sector	***Example(s)***	***Haptics***	***Olfactory***	***Gustatory***	***Acoustics***	***Vision***	***Sum***
Automobile	*Car*	●●●●	●●●	●	●●●●	●●●●●	*17*
		●●	●●	●	●●●●	●●●●●	*14*
Technology	*TV*	●●●●	●●	●	●●●●●	●●●●●	*17*
		●●	●	●	●●●●●	●●●●●	*14*
Household	*Microwave*	●●●	●●●	●	●●●●	●●●●	*15*
		●●	●●	●	●●●●	●●●●	*13*
Interior	*Couch*	●●●●●	●●●	●	●●●	●●●●●	*17*
		●●●	●●	●	●●●	●●●●●	*14*
Fashion	*T-Shirt*	●●●●●	●●●	●	●●	●●●●●	*16*
		●●●	●●	●	●●	●●●●●	*13*
Office Supplies	*Pencil*	●●●●	●●●	●	●●●	●●●●	*15*
		●●	●●	●	●●●	●●●●	*13*
Hygiene / Cosmetics	*Perfume*	●●●●●	●●●●●	●	●●	●●●●	*17*
		●●●	●●●	●	●●	●●●●	*14*
Food	*Coffee*	●●●	●●●●●	●●●●●	●●●	●●●●●	*21*
		●●	●●●	●●●	●●●	●●●●●	*16*
Vacation / Travel	*Flight*	●●●●	●●●●	●●	●●●●	●●●●●	*19*
		●●	●●	●	●●●●	●●●●●	*14*
Healthcare*	*Ointment*	●●●	●●●●	●●●●	●●●	●●●●●	*19*
		●●	●●	●●	●●●	●●●●●	*13*
Leisure*	*Streaming*	●●●●	●●	●●	●●●●	●●●●●	*17*
		●●	●	●	●●●●	●●●●●	*13*
Lifestyle / Jewelry*	*Watch*	●●●●	●●●●	●●	●●●	●●●●●	*18*
		●●	●●	●	●●●	●●●●●	*13*
Legend: ●●●●● à extremely important / ● à extremely unimportant (basically enclosed)/							
*● à original weighting (offline driven) / ● à adapted weighting to online environment/ * additional industry (not included at Kilian* (2010)							

5.1.1.4. OSMI Measurement and Interpretation

After evaluating the individual indicators, a standardized index is prepared for each parameter and rounded to two decimal numbers. Therefore, the result is always between zero and one for each of the five parameters and the analyzed websites. The combined OSMI assesses the sensory quality. The OSMI is defined by the following equations:

Equation 1. Online Sensory Marketing Index Standard (Notation I)

$$OSMI = \frac{1}{5}\sum_{i=1}^{5} x_i \;\; = OSMI = \frac{1}{5}\,(\bar{x}_H + \bar{x}_O + \bar{x}_A + \bar{x}_G + \bar{x}_V)$$

Before interpreting the OSMI values, the effect of sensory deprivation and overload must be considered. Therefore, OSMIw includes a weighting proposal via the weighted aggregate score and can be subsumed as:

Equation 2. Online Sensory Marketing Weighted (Notation II)

$$OSMI_W = \sum_{i=1}^{5} w_i \; x_i \; = \left(\frac{wH\;\bar{x}_H + \mathrm{wO}\;\bar{x}_O + wA\;\bar{x}_A + \mathrm{wG}\;\bar{x}_G + \mathrm{wV}\;\bar{x}_V}{\sum_{i=1}^{\mathrm{I}} \boldsymbol{I}_i}\right)$$

The term w denotes the individual weighting of the respective sense per industry in its version adapted to the online domain (depicted in yellow in Table 20). The weighted OSMIw is then obtained by dividing the sum of the industry-specific weights (noted as "I" for the industry). This methodology is adopted as a foundation due to the initial normalization of the unweighted OSMI. Hence, it is essential to preserve a comparable scale even when incorporating weightings subsequently. As a result, the interpretation of both the OSMI and the OSMIw remains consistent, as both scores are normalized to a range of values between zero and one. In contrast, a weighted arithmetic mean would distort this interpretation and be considered less appropriate than a weighted sum score. As shown in Table 21, an example application of an OSMI measurement is presented, including parameter values and the calculation of OSMIw.

Table 21. Manual OSMI Measurement Template

	Haptics			*Olfaction*			*Acoustics*			*Gustation*			*Vision*		
	0-3	*H1*	***3***	*0-3*	*O1*	***0***	*0-3*	*A1*	***0***	*0-3*	*G1*	***3***	*0-3*	*V1*	***3***
	0-3	*H2*	***1***	*0-1*	*O2*	***1***	*0-1*	*A2*	***0***	*0-1*	*G2*	***1***	*0-2*	*V2*	***2***
	0-1	*H3*	***0***				*0-2*	*A3*	***0***	*0-1*	*G3*	***1***	*0-1*	*V3*	***1***
	0-3	*H4*	***0***				*0-2*	*A4*	***0***	*0-1*	*G4*	***1***	*0-1*	*V4*	***1***
	0-2	*H5*	***0***										*0-1*	*V5*	***1***
	0-3	*H6*	***0***												
$\sum$	***15***		***4***	***4***		***1***	***8***		***0***	***6***		***6***	***8***		***6***
$\bar{x}$	$\frac{4}{15} \approx .27$			$\frac{1}{4} \approx .25$			$\frac{0}{8} \approx .00$			$\frac{6}{6} \approx 1.00$			$\frac{6}{8} \approx .75$		
	$OSMI = \frac{1}{5} \sum_{i=1}^{5} x_i$			$= \frac{1}{5}$ (.27 + .25 + .00 + 1.00 + .75)									$OSMI = .45$		
	Weighting Example belongs to Food-industry														
	$OSMI_W = \sum_{i=1}^{5} w_i \; x_i$ $= \left(\frac{2}{16}\right) *.27 + \left(\frac{3}{16}\right) *.25 + \left(\frac{3}{16}\right) *.00 + \left(\frac{3}{16}\right) *.1.00 + \left(\frac{5}{16}\right) *.75$ $OSMI_W = .50$														

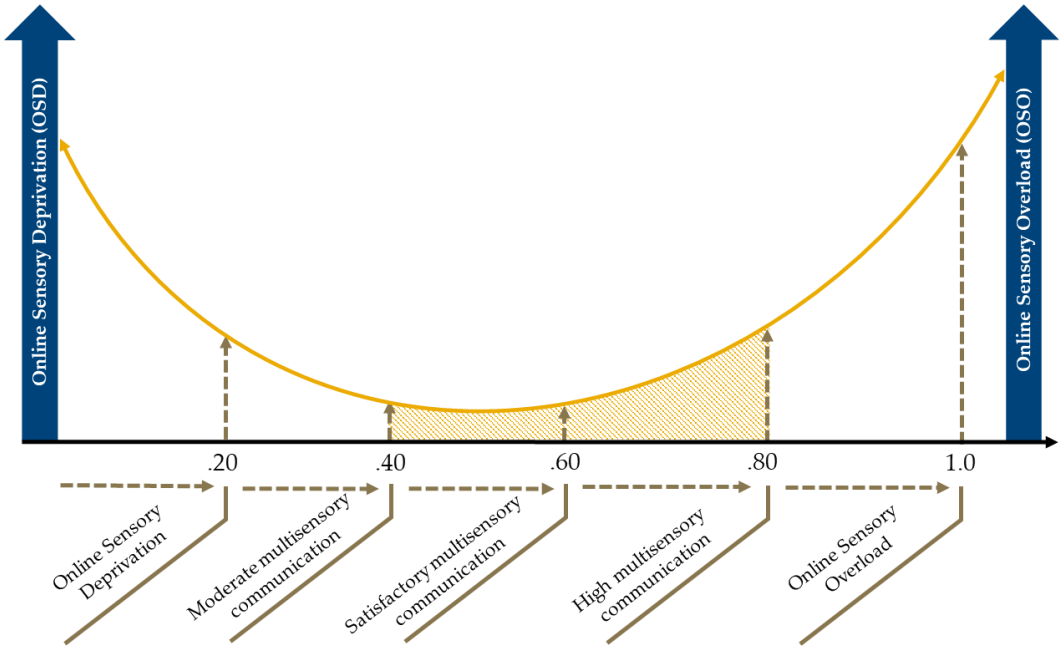
Figure 13 displays various intervals of potential OSMIw calculations, each accompanied by a measured sensory communication quality description. Similar to the unweighted OSMI but more precise to the respective industry, high OSMIw values are considered disadvantageous and, therefore, rather undesirable. This differentiation allows to distinguish between pleasurable and dissatisfying sensory experiences and analyze specific areas for potential improvement within the sensory communication needs of the specific industry.

The obtained results can be utilized to specify sensory optimization or directly compare different industries. It is suggested that OSMIw values greater than .80 should be regarded as Online Sensory Overload (OSO). The preferred range is recommended to be between .41 and .60, denoted as a "good" rating, or

between .61 and .80, considered an "excellent" rating. For cases that fall within the value range between .00 and .20, online sensory deprivation (OSD) is anticipated.

Furthermore, the OSMI is conceptualized as forming a curve that sharply rises towards the OSO, as the probability of sensory overload increases significantly with each additional sense addressed (Homburg et al., 2012; Riedel & Mulcahy, 2019). The chosen method provides the advantage of allowing general comparisons between the analyzed websites. Those websites that have received positive ratings can be compared based on individual indicators.

Figure 13. OSMI Weighting Interpretation



5.1.2. Manual Field Study Application of the OSMI

Based on 16 websites from four different industries, the manual OSMI analysis approach is set up for a field test. The selected companies are from the technology, fashion, food, and automotive industries. Table 22 provides the manual OSMI results for each of these industries as an overview. The findings will be brought up separately for each industry.

Table 22. Results from the OSMI Manual Field Study

Industry	*Companies*	*Ø-Haptics*	*Ø-Olfactory*	*Ø-Gustatory*	*Ø-Acoustics*	*Ø-Visuality*	*OSMI*	*OSMIw*	*Ø OSMIw / Industry*	*abs. Var.*	*rat. Var.*
Automobile	*VW*	*.53*	*.00*	*.00*	*.38*	*.75*	*.33*	*.45*	*.43*	*.12*	*36.19%*
		.08	*.00*	*.00*	*.11*	*.27*					
	Tesla	*.33*	*.00*	*.00*	*.00*	*.75*	*.22*	*.32*		*.10*	*45.83%*
		.05	*.00*	*.00*	*.00*	*.27*					
	Ford	*.47*	*.00*	*.00*	*.00*	*.88*	*.27*	*.38*		*.11*	*41.27%*
		.07	*.00*	*.00*	*.00*	*.31*					
	GMC	*.60*	*.00*	*.00*	*.75*	*.75*	*.42*	*.57*		*.15*	*35.20%*
		.09	*.00*	*.00*	*.21*	*.27*					
Fashion	*Tommy Hilfiger*	*.33*	*.00*	*.00*	*.00*	*.88*	*.24*	*.41*	*.45*	*.17*	*71.33%*
		.08	*.00*	*.00*	*.00*	*.34*					
	Hugo Boss	*.53*	*.00*	*.00*	*.63*	*.75*	*.38*	*.51*		*.13*	*32.90%*
		.12	*.00*	*.00*	*.10*	*.29*					
	Levi`s	*.40*	*.00*	*.00*	*.00*	*.75*	*.23*	*.38*		*.15*	*65.55%*
		.09	*.00*	*.00*	*.00*	*.29*					
	Nike	*.33*	*.00*	*.00*	*.50*	*.88*	*.34*	*.49*		*.15*	*43.72%*
		.08	*.00*	*.00*	*.08*	*.34*					
Food	*Ben & Jerrys*	*.40*	*.00*	*.83*	*.38*	*.63*	*.45*	*.47*	*.41*	*.03*	*5.75%*
		.05	*.00*	*.16*	*.07*	*.20*					
	Häagen-Dazs	*.20*	*.00*	*.67*	*.00*	*.88*	*.35*	*.43*		*.08*	*21.61%*
		.03	*.00*	*.13*	*.00*	*.28*					
	Nespresso	*.27*	*.25*	*1.00*	*.00*	*.75*	*.45*	*.50*		*.05*	*10.68%*
		.03	*.05*	*.19*	*.00*	*.23*					
	Coca-Cola	*.13*	*.00*	*.83*	*.00*	*.25*	*.24*	*.25*		*.01*	*3.31%*
		.02	*.00*	*.16*	*.00*	*.08*					
Technology	*Apple*	*.67*	*.00*	*.00*	*.88*	*1.00*	*.51*	*.77*	*.74*	*.26*	*50.42%*
		.10	*.00*	*.00*	*.31*	*.36*					
	Samsung	*.87*	*.00*	*.17*	*.88*	*1.00*	*.58*	*.81*		*.22*	*38.33%*
		.12	*.00*	*.01*	*.31*	*.36*					
	Microsoft	*.67*	*.00*	*.00*	*.88*	*1.00*	*.51*	*.77*		*.26*	*50.42%*
		.10	*.00*	*.00*	*.31*	*.36*					
	Hewlett-Packard	*.33*	*.00*	*.00*	*.75*	*.88*	*.39*	*.63*		*.24*	*60.53%*
		.05	*.00*	*.00*	*.27*	*.31*					
Note: All URLs were retrieved on 16.07.2021 (Exception: Apple's URL was visited on 26.09. due to product launch).										***.14***	***38.32%***

5.1.2.1. ***Food Industry***

Since the food industry is highly horizontally diversified, websites from the ice cream, coffee, and soft drinks industries were selected to obtain a different perspective on the over-arching industry. Nespresso leads the OSMI calculations for this industry with an OSMIw of .50, followed by Ben & Jerry's scoring .47, Häagen-Dazs scoring .43, and Coca-Cola scoring .25. Due to the weighting of the OSMI, an increasing correction of the unweighted OSMI values by .04 on average was calculated for the food industry. The weighting caused the automotive and fashion industries to improve OSMI values slightly. In detail, the most significant change was observed in Häagen-Dazs', whose OSMIw is approximately .08 higher than the unweighted OSMI. For Nespresso, the OSMIw increases by .05, Ben & Jerry's OSMI increases by .02, and Coca-Cola´s OSMI by .01. The reason for this just slightly positive adjustment is apparent based on the industry-specific weighting of individual senses, according to which haptics were weighted with only three of five possible points. In addition, 40% were deducted due to limited imaginative ability. Ambitions in the gustatory sensory appeal were also reduced by 40%.

The generally low weighting of the parameter haptics is also reflected in the findings, representing the lowest average values for haptic consumer appeal across all four industries. Nevertheless, the haptic sense plays a vital role in sensory communication, even if haptics may be secondary in the food industry. This is shown by the websites studied addressing the haptic and visual senses online and the expected taste senses. A closer look at the haptics parameter reveals that Nespresso and Ben & Jerry´s applied text-based haptic imagery, including written requests (H1). For instance, phrases such as, *"[…] so spoon in while you can!"* (Ben & Jerry´s) or *"Take your coffee enjoyment to a new level"* (Nespresso) foster haptic imagery. Other haptic indicators of the OSMI framework were used less frequently and sometimes at lower quality on the websites. For instance, most of the pictures placed throughout the websites were small. There was no possibility of zooming in to see more detailed images. 3D content was not available (H4). In addition, Ben & Jerry´s, for example, placed a spoon beside the ice cream to foster haptic and gustatory imagination. In contrast, within most pictures, Häagen-Dazs put a spoon on the left-hand side, which has been proven by Elder and Krishna (2012) to be less effective in sensory imagination. However, only Häagen-Dazs used images from a

first-person perspective (H2), which strongly reinforces the imagined haptic experience of the product. On the other hand, product videos (H5) were applied by only Ben & Jerry's, which showed the product in action and while being explained by a spokesperson.

Expectedly, the taste of the advertised products was strongly emphasized on all four websites. Except for Häagen-Dazs, all websites utilized excellent text-based gustatory imagery (G1), including written requests combined with appropriate taste-stimulating images. A strong example is a formulation such as, *"Make every coffee moment an unforgettable experience!"* (Nespresso), combined with a picture of a woman enjoying a freshly brewed coffee. Other professional examples of utilizing G1 were given by formulations such as *"Sweeten Up Your Inbox"* (Ben & Jerry's) or *"Discover more chocolate"* (Häagen-Dazs).

A closer examination of the use of visual indicators uncovered interesting insights. For example, text-based visual imagery was absent from Ben & Jerry's website but was given with indirect formulations on Häagen-Dazs' and Nespresso's websites. Häagen-Dazs described how they create their flavors by choosing phrases such as the following for different products: *"We blend spoonful after spoonful of buttery roasted pecans [...]" and "[...] swirl in ribbons of creamy, smooth peanut butter."* Using these indirect descriptions, they referred not only to the taste but also to the production process of the ice cream, which generates a visual image of the product. In this context, the proximity of the text-based indicators V1 and G1 became apparent, and further connections to A1 and O1 would be equally conceivable. At Nespresso, V1 is restricted only to promoting technical products, such as coffee machines. For example, they described the product: *"With its chrome accents, it will certainly fit any kitchen."* The other visual indicators of the OSMI framework were partially implemented just as well, including the color scheme of the websites (V2), which mostly matched the product and brand except on Coca-Cola's website. To a certain extent, Nespresso enlarged the product, especially the color of the coffee capsules, on the general background and created an enhanced visual sensory experience.

*5.1.2.2. **Automotive Industry***

The manual investigation of the automotive industry focused on international corporations, namely VW, Tesla, Ford, and GMC. This mix of companies was deliberately chosen to examine both relatively new and well-established companies with different sales figures. During the analysis of the websites, the focus was exclusively on the subpages dedicated to their respective electric models. This decision was made due to the increasing global trend towards electromobility, which strongly emphasizes advertising measures related to electric vehicles. It can be assumed that the websites are regularly updated. Despite this, the analysis revealed a divided picture of sensory communication elements among the four websites studied. The best weighted OSMI score was achieved by GMC at .57, followed by VW at .45, Ford scored at .38, and Tesla at .32 (average OSMIw of .43). A closer examination of the use of the five senses' indicators revealed that as could be expected, neither the sense of smell nor taste was addressed. Conversely, there was a strong focus on haptic and visual stimuli, while the auditory sense is only sporadically considered.

The haptic consumer approach predominantly relied on textual and pictorial elements. Advertised electric vehicles and their features were extensively described in narrative form to stimulate haptic imagination. GMC and VW specifically incorporated requests for haptic imagery and received the highest rating for indicator H1. For example, GMC used the phrase *"Let the world in by removing the four panels and the front I-Bar and lowering the power Rear Drop Glass,"* and VW promoted the haptic experience of their new ID.4 vehicle by stating, *"Get your fingers warmed up."* Both statements are formulated as imperatives, engaging the consumer's sense of touch and encouraging haptic imagination. This effect could be further enhanced through 3D product visualization, product videos, or virtual try-ons (H4-H6). However, these content variants were not universally utilized across the examined websites. VW offered a virtual try-on feature that allowed users to project the vehicle into their space using their cellphone camera.

Moreover, all manufacturers effectively addressed the visual sense due to the balanced design of sensory texts combined with corresponding visuals, resulting in up to excellent ratings. In contrast, only GMC and VW adequately reached the

auditory sense by providing sensory information about the vehicle's sound system. However, Tesla and Ford do not emphasize acoustic-style elements.

5.1.2.3. ***Fashion Industry***

When analyzing web pages from the fashion industry, a selection was made of well-known, high-quality brands such as Tommy Hilfiger, Hugo Boss, Levi's, and Nike, catering to different target groups and serving different purposes. To simplify the analysis of fashion websites, a focus was placed on continuously examining one to two websites. Following this approach, the best-performing website for Hugo Boss achieved an OSMIw score of .51, followed by Nike with .49. Tommy Hilfiger scored .41 on the OSMIw scale. At the same time, Levi's obtained a score of .38 (average OSMIw .45). Similar to the automotive industry, none of the fashion sector websites studied addressed the olfactory or gustatory senses. However, considering clothing is traditionally experienced goods, the sense of touch (haptic sense) plays a distinctive role and was emphasized by all websites. The haptic parameter revealed that Hugo Boss achieved the highest unweighted partial score of .53, primarily because it was the only fashion company that incorporated ratings of H4 (3D content). It's important to note that the 3D sensory content was limited to virtual store tours and did not include individual products. Nonetheless, virtually exploring a company's showroom evokes a sense of touch. Furthermore, the use of text-based haptic imagery was at a satisfactory level. Tommy Hilfiger and Levi's excelled in H1 scoring by using imperatives and active verbs, such as "*Accentuate your waist with the belt on this gender-neutral pinstripe blazer that perfectly accentuates your figure.*" (Tommy Hilfiger).

The visual parameter received significant attention within this industry, resulting in all websites scoring above .50. Specifically, Nike and Tommy Hilfiger stood out with a score of .88. Indicator V1, which relates to text-based visual imagery, was also present in indirect formulations on all four websites that were examined. Additionally, both Levi's and Tommy Hilfiger utilized written prompts to evoke visual imagery. For instance, Levi's included the following written request: *"Close your eyes. Think 'jeans.' Now open. They were 501s®, right?"* This effectively enhances the visual representation of the promoted product. Moreover,

the color design (V2) of all four fashion websites was sensually congruent with the respective products as part of the visual parameter framework.

*5.1.2.4. **Technology Industry***

Like the food industry, the technology sector can be categorized into various subsectors. However, for the sake of practicality in the field study, the focus was narrowed down to the smartphone and laptop sectors. The OSMI results demonstrate the highest overall scores among the four industries analyzed. For instance, in the smartphone industry, Apple achieved an OSMIw score of .77 for their subpage showcasing the iPhone 13 Pro at the time of the release in September 2021, while Samsung scored even better at .81 for their multisensory content featuring the Samsung Galaxy S21 Ultra. Similarly, Microsoft (.77) and Hewlett-Packard (.63) obtained also rather high OSMIw scores. Additionally, the most significant positive change in OSMI results was observed with OSMIw values of .26 for Apple and Microsoft. This is primarily due to the importance of acoustics in the industry, and the values achieved for this parameter remain unaffected by the 40% reduction in score for sensory imagery. In contrast, many other websites did not incorporate acoustic elements in that depth. Another interesting finding is that the four technology websites examined were the only ones among all four industries to achieve the highest score for text-based imagery in both H1 and V1. For example, Hewlett-Packard utilized phrases such as *"Enjoy greater responsiveness from our scissor mechanism […]"* to evoke haptic imagery (H1) and *"Explore the Zbook Studio—power to free the creative mind"* to enhance visual imagery (V1). On the other hand, Apple sent messages like "*Customize your camera to lock in your look"* for H1 and *"Get right to the good stuff"* / *"Use AR to see them from every angle"* for V1.

Acoustic sensory design was also a significant focus in the technology sector. All four websites employed indirect formulations using keywords like *"sound"* or *"hear"* to evoke text-based acoustic imagery. Moreover, Microsoft incorporated written requests to enhance imagery regarding A1, such as *"Enjoy movies, music, and virtual meetings with amazing detail, richness, and depth thanks to Dolby Atmos® sound."* However, there was room for improvement in image-based acoustic imagery (A2) for the other companies in the sample. Furthermore, due to the audio included in the videos, the rating of A3 was suitable for all four companies, as the

music used was attuned to the senses and could be played with a click. The video elements included speakers (A4) who explained the products, and their voices aligned with the senses and conveyed positivity (except for Microsoft).

Gustation had minimal impact on the technology industry. However, (imagined) gustatory stimuli can contribute to a multisensory consumer approach (Gallace et al., 2011; Spence et al., 2014). Among the websites, only Samsung utilized a picture of a zoomed-in sushi dish to explain the zoom function of the featured product. This promotes image-based gustatory imagination indirectly at a low level, even though it is not the primary focus of sensory consumer targeting.

On the other hand, the visual parameter played a crucial role in the technology industry. This is particularly evident in the top scores for text-based visual imagery (V1) across all four examined websites. Additionally, the web page design heavily relied on high-quality graphics, employing color (V2) and contrast (V5) to define the sensory experience. In Addition, images were extensively and effectively utilized, including keyframes (V3) and dynamic images (V4).

5.1.3. Discussion

The 16 e-commerce websites that were examined demonstrated a noticeable emphasis on the sensory modalities specific to their respective industries. Based on the conducted study, RQ5 can be confirmed. It has been shown that sensory elements in the context of industry-specific e-commerce platforms can be measured by developing an evaluation proposal for sensory content in digital environments.

Interestingly, the calculations of the weighted OSMI were significantly influenced by the proposed weighting, given the fact that three senses were generally rated -40% compared to visual and haptic cues placed on the websites. It could be an option to try out different heuristics at lower levels to generate different OSMI values. However, solely relying on the average OSMIw values per industry is not conclusive enough. It is necessary to examine the individual parameters and indicators more closely. In terms of parameters, both haptic and visual senses received the most attention across all industries and websites. Acoustic parameters came next, followed by gustatory parameters, which are primarily addressed by the food industry. On the other hand, the olfactory sense was mostly neglected.

Nonetheless, when comparing the absolute value adjustments with the percentage adjustments resulting from the weighting, it was found that, on average, there was a 38.32% increase in the unweighted OSMI, ranging from only 3.31% (Coca-Cola) to 71.33% (Tommy Hilfiger). Comparing the average OSMIw values per industry, the technology industry demonstrated the best performance from a multisensory perspective with an average score of .74, followed by the fashion industry (average score of .45), the automotive industry (average score of .43), and finally, the food industry (average score of .41). These results further reveal identifying similarities and differences between industries through the application of the developed OSMI measurement proposal is feasible.

In Addition, by examining the individual indicator results, it can be concluded that text-based imagery is crucial on almost all studied websites. Professional use of text-based haptic and visual imagery was achieved by incorporating indirect formulations (e.g., narratively delivering content) and written requests (imperative or similar) to stimulate the imagination. For instance, ten web pages achieved the highest score of H1 in text-based haptic imagery, while seven out of 16 web pages obtained the top score for V1 in visual imagery. Surprisingly, companies in the food industry performed the poorest on average for both indicators, with two websites either receiving no rating or the lowest rating. As a consequence, the focus clearly lies on text-based gustatory imagery, where three out of four companies achieved the best G1 score. The conciseness of text-based sensory stimulation holds particular interest for further automatic approaches. High-quality images that showcase products from various angles are deemed necessary for engaging multisensory experiences on e-commerce websites and were effectively utilized on almost all 16 websites. Yet, subtle differences existed in the higher ratings of H2, as the first-person perspective in images was employed on only three out of 16 websites. This feature has the potential to enhance haptic imagery based on static images. Nevertheless, indicators H4-H6 were used in a mixed manner. Five out of 16 websites incorporated three-dimensional product visualization, while nine out of 16 utilized product videos (only three of which demonstrated the product in action and explained it by a spokesperson). In contrast, virtual try-ons were implemented on only three websites, and only two of them offered personalized virtual try-ons. These findings are not surprising, as this type of content is among the most expensive and, therefore, relatively rare across

all industries, despite the technology sector. This may also be related to the limited use of acoustic indicators (again, except for technology firms). The auditory sense was seldom addressed despite being the only sense, alongside sight, that can be directly influenced through the standard functions of most devices.

As a concluding result, an opportunity for improvement in the approach to multisensory consumer experiences becomes visible, and the OSMI supports the reveal of various sensory optimization possibilities and identifies industry-specific peculiarities, as initially initiated by RQ5.

5.2. MACHINE-BASED SENSORY ANALYSES

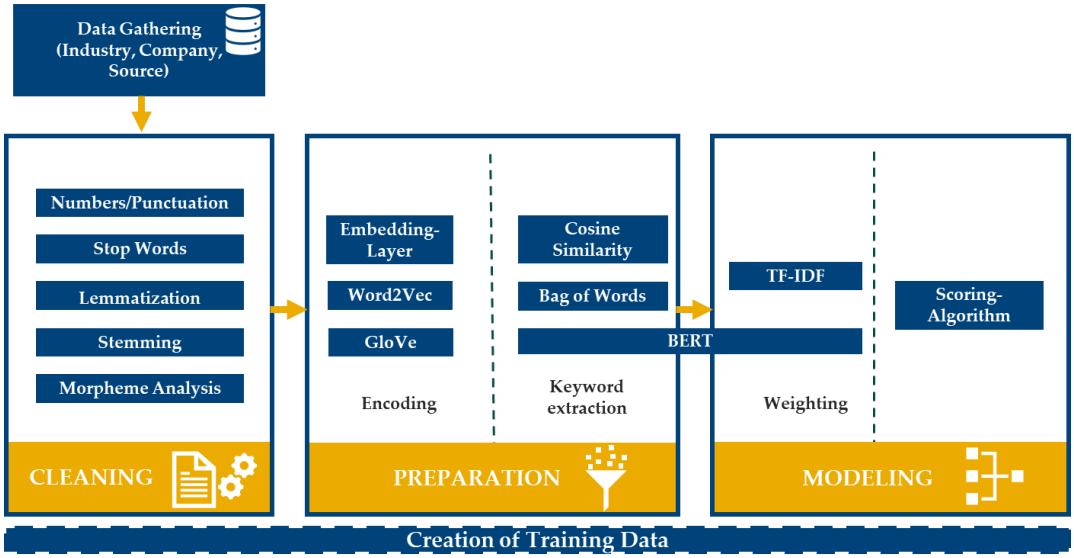
In this section, computational steps are carried out and explained using Artificial Intelligence and big data techniques, which serve as the basis for the artifact and assess its general technical feasibility. The goal is to explore automation options for the assessment based on the previously identified sensory elements of the Online Sensory Marketing Index. Subsequently, texts, images, videos, audio, and interactive elements are crawled, analyzed, and evaluated as sensory assets.

The author of this dissertation received organizational support for these purposes, particularly in terms of crawling and data processing operations of the five sensory content types, as well as partial recommendations and hints regarding suitable tools. However, the analysis of the computational results was primarily conducted by the author to assess their suitability for an automatable tool. Parts of this chapter have already been published by the author in a slightly modified version (Hamacher et al., 2023; Hamacher & Buchkremer, 2022b).

5.2.1. Text-Based Sensory Analysis

Sensory texts, designed to target human senses specifically, have emerged as a crucial component of high importance for website visitors through the SSIs and the B2C surveys conducted in this work. However, a unique approach is required to evaluate texts in a manner akin to the OSMI framework, as depicted procedurally in Figure 14. The process involves based on training data, the steps of data gathering, cleaning, preparation, and ultimately modeling an OSMI value. The steps outlined in the figure will be further illuminated in the subsequent sections.

Figure 14. Data Infrastructure for OSMI Text Machine-based Analysis



5.2.1.1. *Text-Retrieval Process*

Collecting data from websites across various industries serves as the starting point for the following data analysis. Storing this data, sorting it based on attributes, and indexing, if possible, through applying commonly pre-defined libraries from different programming languages build the next steps (Glez-Peña et al., 2013; Zhou & Ordonez, 2021). This process, known as web scraping, precedes web crawling (Khder, 2021). Web crawling is an automated process where computer programs, using Hypertext Markup Language (HTML) webpages and predefined patterns, search for and save predefined data.

The subsequent extraction of these contents was done through web scraping. One of the most common applications of web page crawlers is indexing web pages for search engines. It should be noted that not all data from HTML webpages can be extracted through the web scraping process. Data scraping often forms the basis for creating large datasets from internet content, which can be captured in various forms, such as text, images, or video data (Hejing et al., 2020). Web crawlers are used, for instance, to automatically analyze product data and price comparison portals, aiming to determine products with the best price-performance ratio.

Within the online sensory content analysis context, it was focused on crawling websites from various industries and multiple firms. The Python libraries Scrapy (Myers & McGuffee, 2015) and BeautifulSoup (Hajba, 2018) were used to initiate an automated crawling process.

The goal was to develop a universal website crawler based on the Python programming language. This crawler should be capable of capturing and structuring text data, along with their corresponding HTML tags and cascading style sheet (CSS) classes, from 142 pre-defined English-language websites across. The data obtained from this process forms the foundation for developing the text-related indicators of the OSMI. The data storage was also automated using a MariaDB database, which is an open-source, fully compatible, relational database management system (Dyer, 2015).

For the technical implementation, a virtual server hosted with Linux Debian 10 Buster as the operating system was applied. The Python programming language and a database were also installed on a Linux server.

The subsequent crawling process was characterized by the interplay of the Python libraries (Ryan Mitchell, 2018). Scrapy allowed for the automated initiation of predefined websites and the subsequent extraction of all available text elements. BeautifulSoup was used within the process to extract the relevant classes and tags, which contain the required text elements, before the actual parsing of the HTML structures of each webpage started. To handle JavaScript-based websites, the software Splash was employed, which is a small browser emulation tool (Mehta et al., 2020). At the beginning of the process, Splash was executed for a few seconds to load all JavaScript elements of an e-commerce URL. Then, the complete HTML code was passed to BeautifulSoup for further processing. The retrieval process was terminated once the crawl limit of 500 subpages was reached. After the crawling of the websites was completed, the extracted text data was passed to the database. This transfer was facilitated by another Python script called *pipeline*, which prepared the data and wrote it into the predefined structure of the database.

Following the data transfer to the MariaDB database, the existing texts underwent a review and were classified into various categories that also served as exclusion criteria. This process aimed to clean the acquired data, where the data itself remained unchanged, but a deletion flag was added to the respective database

rows. This approach preserved the original state of the data at the time of the crawling process, enabling subsequent filtering based on these flags and facilitating further processing in the subsequent analysis. The classification was divided into the following five categories: 1 = Text from an incorrect domain; 2 = Text is not in English; 3 = Text contains JavaScript Object Notation (JSON)/HTML tags.; 4 = Text was filtered out based on predefined regular expressions (regex) to detect irrelevant word and character combinations; 0 = Text can be used for analysis.

The generated dataset was further processed using Beekeeper Studio software, which allowed control through Structured Query Language (SQL) commands. The generated table structure included columns such as industry, top-level URL, site-specific URL, crawling timestamp, text, and class. The BRANCHE column described the economic sector of the extracted website, with predefined sectors including Automobile, Cosmetics, Fashion, Food, Healthcare, Household, Interior, Leisure, Lifestyle, Technology, and Vacation. The TOP_URL represented the URL of the website, while the SITE_URL described all the URLs reached from the TOP_URL. The DOWNLOAD_TS column contained the crawling date of the text data. The TEXT column displayed all the texts from each URL subjected to the scraping process. The CLASS column included all the classes or HTML tags from the HTML code. The ALLOWED_DOMAIN column indicated the domain that was processed by the crawler.

Using the mentioned open-source software, combined with Python libraries Scrapy and BeautifulSoup, among others, allowed for the creation of standardized source code capable of extracting text data from approximately 142 websites and storing it in a predefined structure within a MariaDB database using SQL. A significant challenge was extracting relevant text data from different websites, considering the notable variation in the naming of classes and tags used among the websites. This necessitated dynamically reading CSS classes from each webpage before the crawling process, ensuring each text element was considered. Furthermore, it should be mentioned that out of 142 websites, a total of 26 could not be captured through crawling, such as in the case of Ford's website, where a 403-error message indicated that crawling was restricted.

During the crawling process, it was also observed that some websites did not consistently follow the HTML5 structure, such as leaving an HTML tag unclosed.

For instance, the opening HTML tag paragraph was not followed by the corresponding closing HTML tag . As a result, entire HTML blocks were occasionally captured through scraping. This required adapting the source code to clean the crawling and scraping results accordingly.

*5.2.1.2. **Text-Data-Preprocessing***

The structure of the text analysis followed a classical preprocessing approach, involving the removal of less informative stop words and stemming words to their root form. A morpheme analysis was conducted, attributing to words their smallest grammatical unit (morpheme) and determining whether they are nouns, adjectives, or verbs. Adjectives were identified as the most relevant word group for the subsequent stages of sensory text analysis. In this relation, it is notable to point out that lemmatizing the text corpus played a prominent role in keyword extraction. After all, further analysis requires real existing terms. By reducing each word to its base form, it is ensured that the sensory content meaning is not lost. Moreover, lemmatization avoids treating different forms of the same word as separate entities.

*5.2.1.3. **Performing Word Embeddings on Text Corpus***

The preliminary preprocessing facilitated the vectorization of words by applying different word embedding techniques, which will be presented below.

5.2.1.3.1. Single-Word Embeddings

Word Embedding refers to the process of representing discrete variables in a vector space (McMahan & Rao, 2019). In this process, each value is assigned a position in a multidimensional space, represented by an n-dimensional vector (Kuang & Davison, 2020). Each dimension of the vector describes a word property regarding its meaning, semantics, or word class. The advantages of this representation are set in its efficiency in terms of vocabulary size, as the number of dimensions is limited, and the ability to extract information from the word embedding represented by the values of a word vector (Kedia & Rasu, 2020).

Representing words in vectors allows for calculating the relationship between two words. Word similarity can be measured in two different ways. Firstly, it can be determined by the distance between two vectors in the vector

space. Words with similar meanings are closer to each other regarding their vectors than words with completely different meanings. Thus, the distance between two points is a suitable measure for detecting relationships of words in a vector space, as outlined in section 4.1.2.3. This distance is also known as Euclidean distance. It is important to note that the smaller the distance value, the stronger the relationship between the two words. The second measure for assessing the relationship between two-word vectors is cosine similarity, which represents the relationship between two vectors related to their direction and magnitude (Lauren et al., 2017).

Building on this theoretical foundation, various techniques were utilized, which will be briefly explained below. The pre-processed text data was trained utilizing several NLP models (see section 4.1.2.2), such as GloVe, Keras, and Word2Vec, to extract sensory keywords that are particularly meaningful in the context of a related word like "smell" or "taste" using word vectors. The previously described methods of Euclidean distance and cosine similarity were applied to highlight significant words related to human senses.

After training the models, the generated vector associated with each word in the text corpus could be determined through the calculated index. Thus, the embedding vectors for the words in the vocabularies are known. Using Euclidean distance, the nearest words to the search terms in the vector can be determined. Cosine similarity can be used to identify words with the highest vector similarity.

Next to developing different methods and NLP models, it was appropriate to compare the similarities and differences of the identified keywords. Keras, Word2Vec, and GloVe methods could not be directly compared with the BERT approach due to significant differences, especially in terms of the non-analogous approach. The comparison of results suggested that the GloVe and Word2Vec methods could extract more relevant words related to sensory perception from the text corpus compared to the supervised Keras model from the Natural Language Toolkit (NLTK) (Loper & Bird, 2002). In general, the approach of the Keras model was found to be less suitable for extracting optimal word vectors from a text corpus, as the results depicted in Appendix 6 indicate. Consequently, the results of the Keras method were not further used. The results obtained from GloVe and Word2Vec were comparable in many aspects. The GloVe method performed particularly well in the auditory domain, while Word2Vec excelled in taste. Upon

closer examination of specific senses, it was observed that cosine similarity delivered more robust, plausible, and appropriate results compared to the Euclidean distance.

As a result of the keyword extraction process, the most important sensory words were identified by applying the Word2Vec, GloVe, and BERT methods, as well as various distance metrics such as cosine similarity and Euclidean distance. Based on the top one hundred relevant words per sense, TF-IDF values were calculated using the first group of text analysis. In total, 126,051 values for 1,013 unique words from eleven economic sectors were used as the basis, determined through the application of various word embedding techniques.

5.2.1.3.2. Contextual Word Embeddings

Besides the single-word embedding techniques, it was additionally aimed at trying out relatively new big data approaches, such as the Bidirectional Encoder Representation from Transformers (BERT), which works contextually on text corpora (Khurana et al., 2023). BERT is designed to pre-train bidirectional representations from text by considering both the left and right context in all layers. By adding an output layer, pre-trained models can be optimized for specific purposes through a finetuning process (Devlin et al., 2019).

BERT's specific requirements for data quality and composition as a contextual NLP method necessitated a separate evaluation of this approach in assessing sensory texts. Accordingly, in the present case, a model was subjected to training aimed at semantic textual similarity to start a finetuning process. Hence, BERT determines context-based word embeddings for all input tokens.

For model fine-tuning, a training dataset was mandatory to provide insight into the semantic equivalence of pairs of texts. Such a dataset can serve as input for the model against which it is intended to be optimized. Consequently, the network was trained using a Siamese network architecture. For each pair of sentences, embeddings u for sentence A and v for sentence B were derived through a separate transformer network. Finally, the cosine similarity between the two output vectors was computed and compared with the input score. The network's weights were adjusted through a regression objective function that employs a loss function based on the mean squared deviation (Reimers & Gurevych, 2019).

An extensive set of Amazon reviews was used for fine-tuning. This dataset spans multiple product categories and provides comprehensive coverage of sensory aspects, making it inherently suited for OSMI assessment.

Subsequently, cosine similarity metrics were employed to evaluate the BERT models. The calculated cosine similarity between sentences with a high relative frequency of keywords and randomly assigned sentences served as the label. To evaluate the model results, this cosine similarity was compared with the cosine similarities determined by the fine-tuned model using Pearson correlation, with a minimum level of ≥ .80 to retain only relevant texts. The results exhibited substantial correlations, exceeding r = .70 for all senses and surpassing r = .85 for gustation. Nonetheless, within this correlation range, BERT yielded the lowest value for the auditory sense. Based on this, it could be observed that two factors have a direct impact on the quality of the model. First, the quality of the keywords has a decisive role. Secondly, aligning the review texts with the corresponding sensory aspect significantly impacts the model's effectiveness.

Accordingly, the BERT results were integrated into the subsequent OSMI calculation phase and aligned with values derived from single-word embeddings.

*5.2.1.4. **Modeling-Text Data for calculating OSMI values***

The generated lists of keywords served as input for the subsequent OSMI scoring calculation for the textual part. The term frequency-inverse document frequency (TF-IDF) was used in this relation (Salton & Buckley, 1988). The TF-IDF values were calculated according to Ao et al. (2020) with the following equations:

Equation 3. Term Frequency

$$TF(t,d) = \frac{count(t\ in\ d)}{len(d)}$$

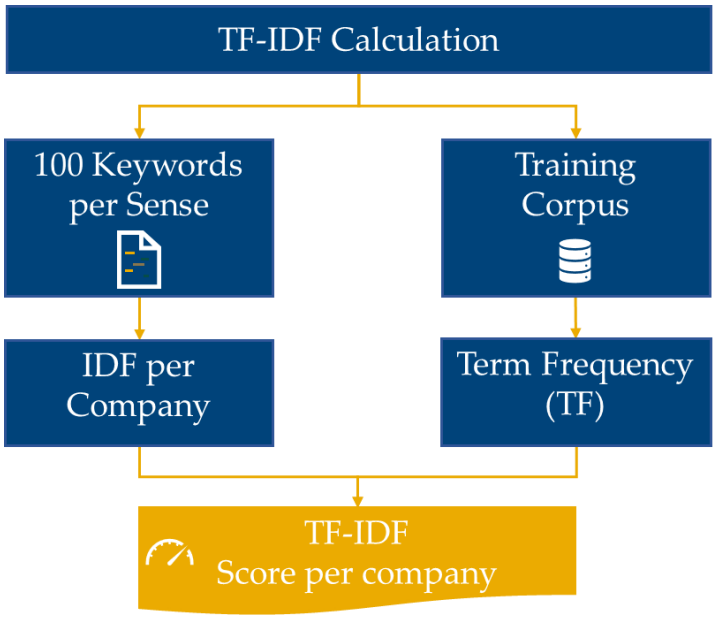
Equation 4. Inverse Document Frequency

$$IDF(corpus,n) = \log_e\left(\frac{len(corpus)}{1+n}\right)$$

Equation 5. TF-IDF Score

$$TF - IDF\ Score = Term\ Frequency\ (TF) * Inverse\ Document\ Frequency\ (IDF)$$

Figure 15. TF-IDF Calculation Scheme



The *t–term* represents a word from the list of keywords in *d*-documents, a dataset of words per company. The n reflects the number of documents that contain the word t, and the corpus consists of all documents (companies per industry). The TF-IDF values reflect the importance of a word to a document in a document collection, as depicted in Figure 15. To be able to compare the individual word similarities of the models per sense, the distributions were each scaled by means of a min-max scaling (Larose & Larose, 2015). Applying Equation 6 ensured that all word similarities were scaled to a normalized value range between zero and one.

Equation 6. Min-Max Scaling for Normalization of TF-IDF Values

$$x' = \frac{x - min\,(x)}{max(x) - min\,(x)}$$

For each analyzed e-commerce website, three scenarios emerged: no sensory keyword has been detected, one sensory keyword detected, or multiple keywords related to the senses were found. In the absence of a specific sensory keyword, the score was set to zero. When only one word was present, using Min-Max Scaling became impractical, necessitating a switch to the Sigmoid function. Otherwise,

Min-Max Scaling was employed to compress values from zero to one. These scaled values were then multiplied by the maximum OSMI indicator scaling (*3). This augmentation ensures that scores are associated with each website, presenting a comprehensive view of scores per site.

In addition, the TF-IDF calculation established a relationship between specific words and individual sensory aspects, allowing their significance to be measured. A more detailed analysis of the determined OSMI values is performed in combination with the results of the image analysis, as outlined in Section 5.2.6.

To pursue the BERT approach, a modified OSMI calculation was required. The outputs of the BERT model consisted of cosine similarities for each sensory aspect and each identified sentence on a webpage. Given that these outputs inherently ranged between zero and one, the methodology could align with the initial procedure without necessitating data normalization. It necessitated merely multiplying each value by three and then computation of the arithmetic mean across all five senses. A deviation from the TF-IDF approach was the imperative consolidation of values from all sentences on a webpage. Prior to calculation, all tuples within a dataset were grouped based on attributes such as "Company," "Source," and "Industry." Lastly, the resultant dataset again featured an entry per company, an OSMI value per sense, and an overall OSMI value.

5.2.2. Image-Based Sensory Analysis

This section addresses the image analysis procedures, noting the challenges and successes of crawling, processing, and transforming into OSMI-relevant data.

5.2.2.1. Image-Retrieval Process

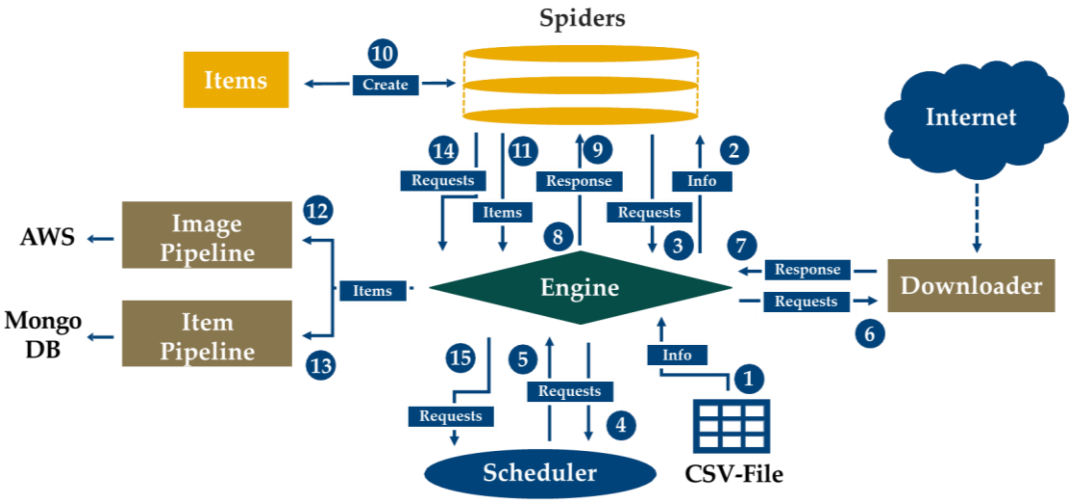
The procurement of e-commerce image data was realized analogously to the web scraping process by applying the Python-based Scrapy framework. However, the storage concept differed significantly from the text data acquisition. The substantially larger data volumes of the image files required scalable object storage in the form of the Amazon S3 cloud storage. For storing the metadata associated with the image files, a non-relational MongoDB database management system was chosen as the operating system due to its schema-free nature.

Prior to conducting the web scraping process, the definition of specific requirements was necessary. Alongside the relevant images for the subsequent OSMI analysis, the websites also contained obsolete graphics, such as logos, banners, buttons, icons, or quality seals. These had to be filtered out. Furthermore, the JPEG file format was chosen for storage. The metadata attributes were predefined, with each image being assigned a unique identifier, as well as the company, industry, URL, and size of the image in pixels. During the crawling process, a target of examining 50 sub-pages per company at a maximum level was aimed for without leaving the company's website. The association between image files and metadata was based on the globally unique file name.

The initial configuration of the framework was extended to include integration with the cloud storage at the beginning of the web scraping process. Subsequently, an initial filter was applied, specifying a minimum size of 95 x 95 pixels for an image. This restriction allowed for the exclusion of buttons, icons, and quality seals in advance. Additionally, a timeout of 15 seconds was configured for web page requests. The following steps in the web scraping process are illustrated based on the schematic architecture of the framework shown in Figure 16.

First, requests for the company websites were generated in a spider and passed to an engine (3). Spiders are Python classes that describe the process of

Figure 16. Image Retrieval Process



Author's elaboration based on https://docs.scrapy.org/en/latest/_images/scrapy_architecture_02.png

crawling web pages and extracting their contents, also referred to as scraping. The initial request corresponded to the request for the homepage of each respective company. These requests were then passed from the engine to the scheduler (4), which enabled the sequential processing of all requests. The downloader ran the requests and retrieved the entire HTML code of the requested web page. The engine then returned this data to the spider (8), which processed it utilizing a parser (9). The parser was a custom development different from the Scrapy framework.

The implemented parser logic attempts to collect the URLs of linked images and graphics within the HTML code (10) to download the image files and metadata based on these addresses (12 & 13). Furthermore, additional URLs on the respective web page were identified as requests that are passed to the Scheduler (14 & 15) and processed in the scraping process. The parser logic is described in detail further, considering the previously mentioned requirements not to leave the web page or change the specified language version. In an initial analysis step, corresponding HTML tags and classes were defined as search criteria. Subsequently, using XML Path Language and CSS selectors, the URLs were extracted from the HTML code. Remarkably, all URLs of images on responsive websites were predominantly stored in sets. These sets represent individual strings that contain multiple URLs to the same image in different resolutions. The last entry in each string contains the image in the highest available resolution and was extracted.

After extracting the URLs, further processing was performed. Queries and duplicates were initially removed. Queries are part of a URL and follow a question mark. They consist of parameters and specify, for instance, filters or sorts that can be used to customize the display of the web page. Following that, according to the requirements, another filter was applied that sorted out image file names based on keywords indicating their use as a logo, banner, or button. Furthermore, the URL´s syntax and accessibility were checked, as well as the type of the linked file. URLs that were not accessible or did not lead to image files were temporarily filtered out by sending the corresponding Hypertext Transfer Protocol (HTTP) request and additionally checking the content type and status code in the header of its response. The status codes 200, 301, and 302 and the types of Multipurpose Internet Mail Extensions (MIME), namely Joint Photographic Experts Group (JPEG) and Portable Network Graphics (PNG) in the content type were defined as valid. An invalid

HTTP status code, except for code 403, led to a re-request of the URL. If the second attempt was unsuccessful, too, the URL was discarded. Thus, the URLs were called again via HTTP request, and the linked images were downloaded and stored in the Amazon S3 bucket. If an image was retrieved that was already stored in the S3 bucket before, it was overwritten. However, the metadata for this duplicate image was still stored. Image files in the PNG format were converted to the JPEG format. The predefined metadata attributes for each image were stored in the spider class and saved in the MongoDB database in JavaScript Object Notation (JSON) format.

Like the processing of image file URLs, further URLs were identified on the respective web page. However, the MIME-type HTML was defined as valid in this context. After processing the URLs, they were passed back to the scheduler and marked for further scraping process. An individualized quiring process ensured that up to 50 different sub-web pages were examined per e-commerce website.

As a result, 116 company websites could be examined using the web scraping process while adhering to the defined requirements. The analysis of additional websites in the target list could not be carried out. Possible reasons for this include captcha verifications, age restrictions, dynamic runtime website construction using JavaScript, or general security measures taken by the companies.

Out of the 6,394 requested URLs from the websites, a total of 29,526 images were extracted. Among these images, 22,781 were recognized as unique and stored in the cloud storage.

5.2.2.2. ***Image-Content-Analysis***

This subsection highlights the various analyses performed on the retrieved image corpus to best fit the OSMI indicators from the manual setup.

5.2.2.2.1. Image Color and Contrast Intensity

The indicator G3 provides information about using color schemes primarily in images from the analyzed websites (and the website at all) with a particular focus on gustation. It can be distinguished between two values: Weak (indicator value of 0) and Standard (indicator value of 1). A weak value describes the absence of colors or grayscale or the presence of many mixed and vibrant colors. On the other hand, a standard value describes the sensually congruent single-color application.

Initially, the retrieved images were examined for the absence of colors. For this purpose, two types of images, grayscale and RGB (Red, Green, and Blue), were introduced. In grayscale images, the image content is stored by assigning a numerical value from 0 to 255 to each pixel within a two-dimensional array. This value represents the color intensity of the pixel, where 0 corresponds to black and 255 corresponds to white. The indices of the columns and rows in the two-dimensional array represent the pixel coordinates in the image. The image content of RGB images is stored using three-dimensional arrays. Three identical-sized two-dimensional arrays are stored, each representing a color channel of the image (Ramanath et al., 2005). The color intensities of the primary colors red, green, and blue are represented through their respective color channels. The number of dimensions of the image provides information about a weak value of indicator G3. A two-dimensional image corresponds to the value 0. A three-dimensional image needs to undergo a more detailed examination to determine G3 correctly. In this context, a color-overrepresentation of many mixed and vibrant colors was to be identified. This task was determined based on the number of dominant colors in the provided images, starting with establishing an understanding of the RGB color model's additive color system.

Color impressions in the additive color system are generated by mixing the primary colors in different intensities. Mixing two primary colors with equal intensity produces the secondary colors yellow, cyan, and magenta. The brightness of light determines the color intensity. When the primary colors are mixed with a brightness of 0 (no light), black is produced. The mixture of all three primary colors at their maximum intensity results in the color white. By mixing the three-color channels from the three-dimensional array of the image, the actual color image is created (Trussel et al., 2005). Consequently, color dominance can be determined by identifying each pixel's corresponding color and storing a relevant color label.

The indicator V5 provides sensory-related information about the contrast of the analyzed images. It can be distinguished between two values: Weak (indicator value of 0) and Standard (indicator value of 1). A weak value describes a contrast that is not tailored to the product or brand, while a standard value describes a strong contrast in the analyzed image. As a consequence, to investigate V5, an understanding of image contrast was established. The contrast of an image can be

improved using Histogram Equalization, which flattens the probability density function of the pixel color intensities in the image (Y. T. Kim, 1997). This distribution across the full width of the histogram results in better contrast. Therefore, a small range of color intensities for the pixels and steep peaks in the distribution indicate low contrast and vice versa. The placement of the distribution peaks is not relevant, as weak contrast can be present in both the bright and dark color spectrums. Based on this understanding, a method for measuring contrast was developed using an algorithm that converted the retrieved images under investigation into grayscale images, formed the corresponding histograms, and examined the color intensities of the histograms for the mentioned properties. The evaluation of indicator V5 was based on this analysis and saved in the metadata.

5.2.2.2.2. Object Detection

In the following, further knowledge about the images could be acquired with the help of object recognition. Object recognition is a computer vision technique that enables the identification and localization of objects in images. The chosen approach applying deep learning first detects the objects of different classes in the image and then localizes them. In addressing this problem, a Convolutional Neural Network (CNN) fits best, whose relevance as a problem solver is illustrated below.

CNNs represent a special form of neural networks for processing data with a known grid-like topology (Zhiqiang & Jun, 2017), as outlined in section 4.1.2.1. These networks have two special features that distinguish them from other neural networks. One is the use of the namesake mathematical operation of convolution, and the other is downstream pooling. As presented in the equation below, Convolution describes a mathematical operator that computes a third function, f*g, for two functions f and g. This convolution f*g can be seen as a weighted average of the function f, with the weighting of g. Here, the function value f(x) is weighted by the value g(x-y), giving the value x from f a different weighted average.

Equation 7. Convolution (Yosida, 1965, Chapter 3)

$$(\boldsymbol{f} * \boldsymbol{g})(\boldsymbol{x}) = \int_{\boldsymbol{R^n}} \boldsymbol{f}(\boldsymbol{x}-\boldsymbol{y})\boldsymbol{g}(\boldsymbol{y})\boldsymbol{dy} = \int_{\boldsymbol{R^n}} \boldsymbol{f}(\boldsymbol{y})\boldsymbol{g}(\boldsymbol{x}-\boldsymbol{y})\boldsymbol{dy} = (\boldsymbol{g} * \boldsymbol{f})(\boldsymbol{x})$$

The use case of edge and pattern recognition can illustrate the relevance of convolution for object recognition in images. This is a convolution in two-dimensional space. The image corresponds to the function f, and the function g, referred to as kernel, describes a matrix in the form of an array. The kernel of the size 2 x 2 passes element by element through the input tensor of size 4 x 3 and performs the matrix multiplication. The output is thereby limited to the position in which the kernel lies entirely. Hence, the kernel passes through the input tensor in six areas so that after the convolution, an output tensor of size 3 x 2 results.

Generally, the convolution is followed by pooling. Pooling replaces the output of the network at a given location with a pooled statistical size of the nearest outputs (Goodfellow et al., 2016). Consequently, different pooling variants, such as Maximum Pooling or Average Pooling, provide outputs with maximum or average values of the neighborhood. In each case, the results of the respective kernel are calculated in the detection phase, and the maximum values are transferred to the pooling phase. Finally, pooling is used for downsampling on the one hand and brings the property of invariance on the other. Downsampling refers to a method of reducing units. In image processing, the pixels of the inputs and outputs are reduced in this way. In most cases, a 2 x 2 kernel with stride = 2 is used (Goodfellow et al., 2016), which results in a reduction of the output by a factor of two. For example, an output sensor of size 6 x 6 with a total number of 36 pixels can thus be reduced to a size of 3 x 3 with 9 pixels. Furthermore, pooling helps to make the pooled outputs approximately invariant to small shifts in the input. This is relevant for feature recognition of objects in images when the feature's location does not matter. As an example, an image of a cat can be given here. If the cat is the object to be recognized, the exact position of the feature "ears" is not essential since they are located on the cat's head (see also Figure 18 for illustration).

One of the first CNNs, the LeNet-5, illustrates convolution and pooling interaction. The LeNet-5 has been designed by LeCun et al. (1989) for image classification of handwritten numbers and is considered a pioneer in this field. The neuronal network consists of seven layers. The two convolutional layers, followed by two pooling layers, are used for object identification. This is followed by the classification block with three fully connected layers. Two solution approaches

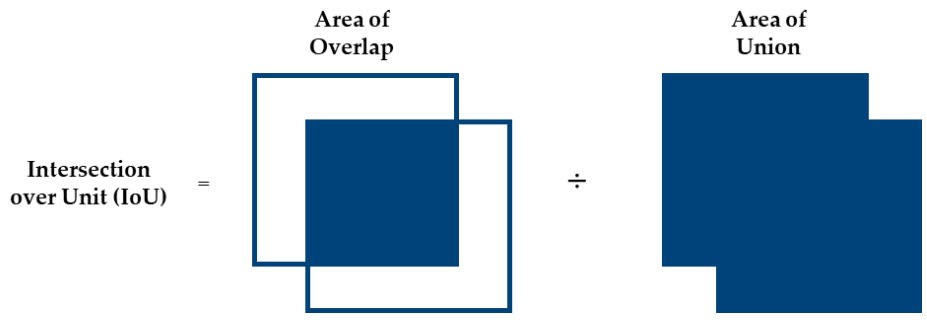
now exist for object recognition, each of which relies on a CNN as a deep learning model (Sultana et al., 2020; Zou, 2019).

Object recognition was performed in several mutually influencing steps in the current proposal. These were region proposal detection, feature extraction using a CNN, and object identification and localization using bounding boxes. This multi-step approach required an immense amount of computation time and caused bottlenecks, especially in real-time applications (Zhao et al., 2019). As a result, a single-stage approach is introduced.

In the regression/classification approach, object identification, as well as localization, are performed in one step. A well-known model of this approach is the You Only Look Once (YOLO) model. It was initially developed by Redmon et al. (2016) as an open-source project and can perform the identification and localization of objects presented on an image in one regression. This namesake, one-step approach brings vital advantages such as speed, a low number of background errors, and robustness to unknown images. Pathak et al. (2018) state that the power of visual recognition systems has tremendously risen in recent years, primarily due to neural networks like deep learning. However, the model still weakens in detecting small or densely crowded objects.

From a processual perspective, the image to be analyzed in the YOLO framework is divided into an S × S grid, and the imaged objects are determined from the cell in which the center of the object is located. Then, for each cell, B outline rectangles, and the respective confidence values are determined. According to Rosebrock (2022), the confidence values are calculated as the product of the certainty that an object is present in a cell and the intersection over unit (IOU) as

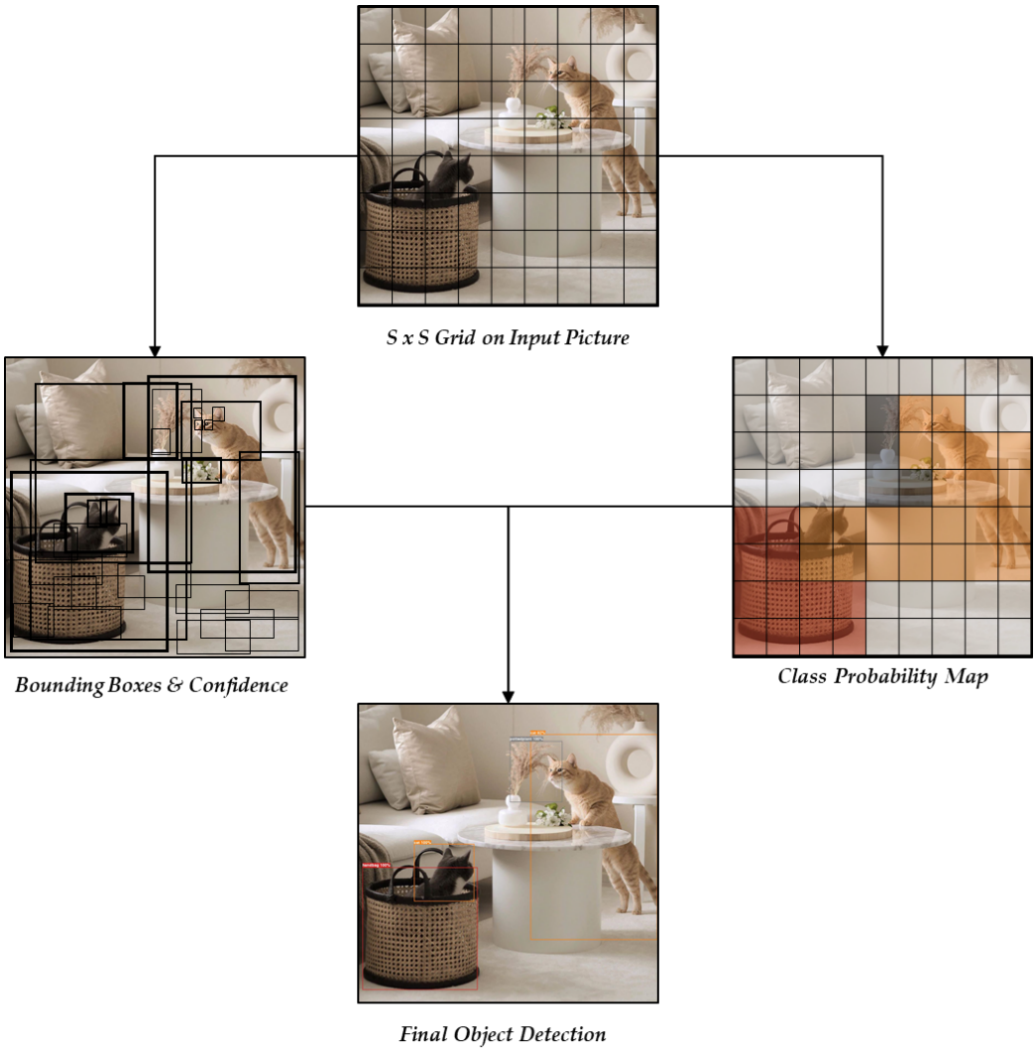
Figure 17. Intersection over Unit (IoU)



Author's elaboration based on Rosebrock (2022, p. 1)

depicted schematically in Figure 17. The IOU indicates the ratio of the intersection of the true and calculated bounding rectangles to their unit (Rosebrock, 2022). Another representation of the YOLO technique's general process is illustrated in Figure 18. Using an actual image, it demonstrates the simultaneous application of bounding boxes with confidence determinations and a class probability map to the respective image.

Figure 18. YOLO Model Operating Principle



Author's elaboration based on Redmon et al. (2016, p. 780). *Picture from: Instagram-Profile "hmhome," Posting 19.09.2020, https://www.instagram.com/p/CFUEJTisQSE/?igshid=MDJmNzVkMjY%3D, last time accessed on 30.06.2023.*

The example depicted in Figure 18 demonstrates a simple image correctly identifying two cats in opposite directions in a living room with 92% and 100% confidence, respectively. However, the container where the dark-colored cat is seated is referred to as a "handbag," even though it is visually accurate. Still, it is more of a home accessory rather than a functional element. It is important to note that this example was not conducted using the latest YOLO variant. It can be assumed that the accuracy would further improve with the latest YOLO version.

Moreover, from another computational perspective, the class membership probability per object class Pr(Class|Object) is determined for each cell. During the training run, this is multiplied by the respective confidence value and results in the class-specific confidence value. The probability that an object is an object of the respective class, as well as the precision with which the bounding box could be determined, is described by this value.

Equation 8. Confidence Level (Redmon et al., 2016, p. 780)

$$Pr(Object) * IOU_{pred}^{truth}$$

Equation 9. Class Affiliation Probability (Redmon et al., 2016, p. 780)

$$Pr(Class_i|Object) * Pr(Object) * IOU_{pred}^{truth} = Pr(Class_i) * IOU_{pred}^{truth}$$

The underlying CNN of the YOLO model consists of 24 convolution layers for object identification and two fully connected layers used to determine the probabilities and bounding rectangles.

The image analysis was carried out by applying the YOLO model as the most recent development stage for object identification. YOLOv5 was released in June 2020 by Jocher et al. (2021). Several model variants exist with different performance characteristics (P. Jiang et al., 2021). The model was used in the fastest but also least accurate variant YOLOv5s (Jocher et al., 2021) at the time of analysis. Bochkovskiy et al. (2020) could already state that YOLOv4 performs 10% more accurately and 12% faster than YOLOv3. Please note that at the time of the analysis, v5 was the latest version, but in the meantime, YOLOv8 was launched and is now even faster and more accurate (e.g., see additionally: https://github.com/ultralytics/ultralytics).

Due to the use of local computing power and the amount of data to be processed, the YOLOv5 variant was used. The program code was adapted for the analysis so that the following attributes could be stored in a comma-separated values (CSV) file for each detected object: Analysis duration; Index and Name of the assigned class; class membership probability; and coordinates of the bounding box. A visually prepared output of the object detection results is shown in Figure 19. These detected objects were added to the images' metadata as attributes. The YOLO image detection output identified multiple objects with varying confidence scores (T. Y. Lin et al., 2014). As summarized in Table 23, all major elements depicted in the image were successfully detected with a corresponding label that describes the element included accurately. Three persons were detected correctly.

Figure 19. YOLO Object Detection in Images

Instagram "Landmann"-Profile, posted on 22.09.2020. Last checked on 01.07.2023. Link: https://www.instagram.com/p/CFcaNaKCNtT/?igshid=MTc4MmM1YmI2Ng==

Table 23. Yolo Object Detection in Images

Class	*Confidence*	*Bx*	*By*	*Bw*	*Bh*
person	*1.00*	*.58*	*.62*	*.24*	*.39*
person	*1.00*	*.28*	*.65*	*.26*	*.43*
person	*1.00*	*.81*	*.57*	*.11*	*.25*
truck	*.70*	*.20*	*.49*	*.49*	*.54*
surfboard	*1.00*	*.89*	*.55*	*.04*	*.15*
surfboard	*.82*	*.82*	*.56*	*.05*	*.12*
bottle	*1.00*	*.71*	*.68*	*.04*	*.14*
bottle	*1.00*	*.43*	*.87*	*.05*	*.12*
wine glass	*.98*	*.79*	*.72*	*.04*	*.07*
cup	*.95*	*.79*	*.72*	*.04*	*.07*
bowl	*1.00*	*.35*	*.78*	*.15*	*.11*
bowl	*.99*	*.82*	*.79*	*.08*	*.04*
potted plant	*1.00*	*.91*	*.75*	*.16*	*.22*
potted plant	*1.00*	*.91*	*.75*	*.16*	*.22*

In Addition, two surfboards were identified, one with a confidence score of 100 % at position .89, .55 (width: .04, height: .15), and the other with a score of 82% at .82, .56 (width: .05, height: .12). Next, two bottles were detected with confidence scores of 100%. A wine glass and a cup were identified with confidence scores of .98 and .95, respectively, both sharing the same bounding box coordinates of (.79, .72) with width: .04 and height: .07, representing that the bounding box naming of a cup is more appropriate. This example illustrates that in some cases, YOLO labeled the same identified object with different meanings. In this case, the wine glass is incorrect in terms of content. Nevertheless, the depicted truck, which was, in fact, correctly recognized, had the lowest accuracy at 70%, probably because of its partly hidden positioning in the back and other image properties that concealed the truck.

It can be assumed that YOLO models of subsequent generations beyond v5 will yield even higher identification results and confidences (P. Jiang et al., 2021).

Nevertheless, v5 is being integrated as an analysis method into machine-based sensory analysis due to its adequate presentation of results at the time of implementation. Nevertheless, based on the identified objects in Figure 19, the YOLO image detection output appears reasonably accurate, identifying various objects with relatively high confidence scores.

5.2.2.2.3. Sentiment Detection

Additional image analysis followed aimed at recognizing sentiments in images represented by events, motifs, faces, and texts. Accordingly, the computer vision platform Amazon Recognition was utilized for these analyses. Amazon Recognition is a paid-for cloud service in the Amazon Web Services (AWS) product family. Although deep learning models are used for the analyses, no machine learning knowledge is required to use the platform.

Amazon Recognition was used by means of an API via the functions of the Python software development kit Boto3. The API was accessed via the instance of a Boto3 client. This instance enabled the invocation of various image analysis functions, to which the previously retrieved images were passed. Subsequently, the analysis results were stored in a CSV file as return values of the functions. The analyses mentioned at the beginning could be accomplished by the call of three functions that were carried out. These functions are explained in the following.

With its label analysis, Amazon Recognition offers the possibility to identify objects, like trees or tables, events like weddings or birthday parties, and motifs, such as landscapes, in images (Abhishek Mishra, 2019). This feature is comparable to YOLO, but due to the proprietary cloud approach, this solution cannot offer the speed and customization capabilities possible with the YOLO model. However, with the recognition of events and motifs, further insights can be acquired from the images. The images to be examined were passed to the function detect_labels. This function returns an array with the corresponding label and the respective confidence value.

Furthermore, hierarchical taxonomies of the assigned labels up to the top level were returned. This took place through the assignment of appropriate corresponding parent labels and is illustrated by the image analysis in Figure 20. The image exemplifies AWS sentiment labeling over the retrieved image dataset.

Figure 20. Sentiment Detection in Images

Instagram "Porsche"-Profile, posted on 01.09.2020. Last checked on 01.07.2023. Link: https://www.instagram.com/p/CElvc_KBR5G/?igshid=ODk2MDJkZDc2Zg==

As depicted in Figure 20, the illustration presents a product photograph that concurrently serves as a mood image. It aims to portray the vehicle's sporty attributes juxtaposed against the expansive rural terrain of a desert (US Mojave Desert) during dawn and dusk.

Table 24 summarizes the AWS label results of Figure 20. Initially, it is apparent that AWS fundamentally operates akin to object detection while extending its capabilities beyond requested sentiments to encompass object recognition within the image. Upon reviewing these outcomes, it becomes evident that accurate identification has been achieved. Specifically, in the image above, the presence of a conventional vehicle has been identified, and high accuracy rates of 94% for a sports car and 90.69% for a more refined classification as a classic coupé.

Table 24. Sentiment Detection in Images

No.	*Label*	*Confidence-level in %*	*No.*	*Label*	*Confidence-level in %*
1	*Car*	*99.93*	*9*	*Outdoors*	*81.99*
2	*Sports Car*	*94.79*	*10*	*Scenery*	*59.33*
3	*Tire*	*94.58*	*11*	*Offroad*	*58.98*
4	*Wheel*	*93.38*	*12*	*Sky*	*58.37*
5	*Coupé*	*90.69*	*13*	*Landscape*	*57.08*
6	*Road*	*89.13*	*14*	*Horizon*	*56.58*
7	*Asphalt*	*88.44*	*15*	*Race Car*	*55.01*
8	*Nature*	*83.50*			

In addition to these object-related attribute recognitions, the supplementary outcomes in the above table showcase accuracy ratings for the inherent sentiment. For this purpose, core features surrounding the actual object were initially identified. These features are notable characteristics that tend to encompass larger areas within the image and are more generalized and representative of the image as a whole. Hence, were not only road (89.13%) and asphalt (88.44%) accurately identified, but also the overarching impression intended to be conveyed to the viewer. This is evidenced by label detections such as nature (83.50%) and the general concept of outdoors (81.99%). While sentiments such as scenery, sky, landscape, and horizon were correctly identified, albeit with notably lower accuracies ranging from 55% to 59%, the sentiment offroad is incongruous within the contextual framework. Moreover, it can be surmised that a "desert" label might not have been recognized due to the limitations imposed by the image frame.

Another option for image analysis using Amazon Recognition is face recognition. The detect_faces function allows for the identification of facial features and emotions from up to a hundred faces depicted in the image, as well as the determination of coordinates for key facial points like the corners of the mouth or the eyes. These results are returned in an array along with their confidence values.

Figure 21. Face and Emotion Recognition in Images

Instagram Nespresso-Profile posted on 13.09.2020. Last checked on 01.07.2023. Link: https://www.instagram.com/p/CFE94EcHXhs/?igshid=MTc4MmM1YmI2Ng==

Face Detection (C. Zhang & Zhang, 2014) and emotion recognition in images like Figure 21 are important criteria for automating image-related OSMI assessments. Hence, the above-shown image aims to convey a positive mood.

As listed in Table 25, most attributes were accurately identified; however, due to differences in seating positions and angles to the lens, results may vary, especially for the calm attribute. In the case of the woman, the opposite was observed, which is obviously incorrect, as the overall setting of the image portrays a relaxed atmosphere, with two people comfortably sitting outdoors in the sunlight, enjoying a cup of coffee. In addition, with a high confidence level (>97%), it has been determined that the depicted individuals are experiencing happiness, and contrasting negative associated emotions, such as fear, were not apparent.

Table 25. Facial and Emotion Detection in Images

Category	*Detail*	*Response**	*Confidence level in %*	*Response**	*Confidence level in %*
		Left (female)		*Right (male)*	
Facial Recognition	*Age group*	*22-34*		*28-44*	
	Smile	*True*	*98.18*	*True*	*94.15*
	Glasses	*True*	*99.42*	*True*	*99.26*
	Sun glasses	*True*	*99.68*	*True*	*97.83*
	Gender	*Female*	*99.99*	*Male*	*99.86*
	Beard	*False*	*99.98*	*True*	*92.08*
	Mustache	*False*	*99.98*	*False*	*81.60*
	Eyes open	*True*	*99.99*	*True*	*99.99*
	Mouth open	*True*	*96.31*	*True*	*88.84*
Emotion	*Happy*	*True*	*99.19*	*True*	*97.87*
	Calm	*False*	*8.24*	*True*	*68.56*
	Angry	*False*	*7.08*	*False*	*40.34*
	Surprised	*False*	*16.10*	*False*	*33.89*
	Disgusted	*False*	*15.92*	*False*	*29.68*
	Confused	*False*	*24.44*	*False*	*27.34*
	Fear	*False*	*6.86*	*False*	*7.89*
	Sad	*False*	*2.25*	*False*	*5.72*

** Please note that the emotions were given as pure confidence intervals by AWS and reflect the probability that the attribute is true. The response itself is a declaration by the author of this dissertation.*

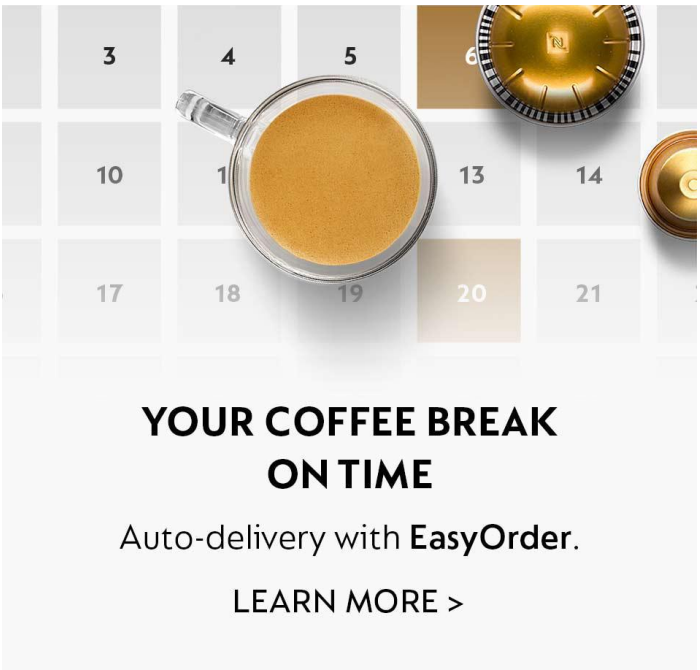
Nevertheless, the examples given support the general possibility of recognizing faces and emotions in images with a high degree of accuracy, leading to the integration of these machine-based sensory analysis techniques into the OSMI automation framework.

5.2.2.2.4. Image-to-Text Detection

Amazon Recognition allows for the detection of texts within images. It can extract up to fifty words in multiple lines, with the text orientation ranging from +/- 90° to the horizontal axis. The detect_text function is used to pass the images for analysis to the text recognition module. Results are then returned as an array. This array includes the recognized text, the confidence value, the coordinates of the bounding rectangle, the bounding polygon consisting of four points for accurately outlining skewed text, and the type of text that can be either a line or a word. An example of the text recognition results for Figure 22 can be found in Table 26.

It can be observed that the example is challenging, as a numbered calendar is visible in the background, and its numerical values were also detected with high confidence. Similarly, the bottom row was output as separate results, and the ">" symbol was not recognized as a text. Notably, further training intensification with AWS can direct to even better outcomes aligning with the dissertation's purpose.

Figure 22. Text Recognition in Images



Nespresso-Website. Last checked on 01.07.2023. Link: https://www.nespresso.com/ecom/medias/sys_master/public/13697515618334/N-EasyOrder-Banners-NavigationPush-AW.jpg

Table 26. Text Detection in Images

Text parts detected	*Confidence-level in %*
YOUR COFFEE BREAK	*99.96*
ON TIME	*99.68*
Auto-delivery with Easy Order.	*97.82*
LEARN	*99.95*
MORE	*99.92*
>	-

Finally, the arrays of the label, face, as well as text recognition, size, height, and width, among additional attributes, were added to the metadata of the images so that the final image CSV file contains all gathered information (see Appendix 8).

5.2.3. Audio-Based Sensory Analysis

Among the four OSMI indicators associated with the auditory sense, A3 pertains to the presence of audio files with appropriate sensory design. It involves integrating the human voice to spread emotions, particularly positivity. The auditory indicator´s retrieval and evaluation prospects will be explained below.

5.2.3.1. Audio-Retrieval Process

The procedural steps for retrieving audio files from e-commerce websites fundamentally follow those of image retrieval outlined in the preceding section, given the multimedia nature of the assets involved. In order to retrieve audio elements, it is initially necessary to elucidate their constituent components. Audio files are physically comprised of a continuously changing quantity of sine and cosine waves representing individually generated sounds, which superimpose to form a composite waveform. The displacement of such a waveform along the ordinate is referred to as amplitude, and the higher the magnitudes of its excursions, the more energy and, thus, a louder sound in the audio element (Pfeiffer et al., 1997). Amplitudes are a potential discriminative feature in audio tracks concerning emotion detection, especially when human voices are integrated

(Sato & Obuchi, 2007). This is because, depending on the volume and message of the spoken text, it can be anticipated that a positively excited speaker would both speak loudly and use positive sentiment words.

For the digital storage of an audio signal, the waveform's amplitude is measured at a fixed frequency, and these values are stored (Maragos et al., 1993). In addition to the zero-crossing rate, which indicates how often the wave function crosses the zero point into positive or negative value ranges, further factors are derived from the fundamental frequencies that compose the measured overall signal. These factors must first be extracted accordingly. Extraction is achieved through a Fourier transformation algorithm, which decomposes a complex wave into a set of simple sine and cosine functions. The temporal dimension is negligible in this context, as a standard time window, according to the Python library Librosa, assumes a window length of 512 samples, equating to 23 milliseconds in the context of speech recognition. This configuration allows for the distinction of (512 / 2) + 1 = 257 different frequency ranges. The number of data points can be increased by overlapping the time windows by a percentage (Allen, 1977). This entire algorithm is referred to as Short-Term Fourier Transformation (STFT). The STFT´s output is a temporal sequence of how much volume the sounds have in each frequency range.

Moreover, Mel Frequency Cepstral Coefficients (MFCCs), akin to the output of STFT, quantify the composition of an audio signal and stand as crucial metrics within speech recognition (Hasan et al., 2004; Logan, 2000). Pertaining not directly to frequencies, MFCCs aim to tailor audio outputs to the auditory sense, condensing them into a concise set of meaningful values. MFCCs are computed applying STFT and refined by consolidating frequency bands (MEL scale) to reduce outputs, using a logarithmic transformation to approximate acoustic perception, and decorrelation to address interdependence among individual data points. Concerning the OSMI, it is particularly pertinent that a correlation between content and volume can be anticipated in a spoken text. This implies that a positively excited speaker would employ positive sentiment words along with louder speech (Lowrey & Shrum, 2007; M. A. Stewart & Ryan, 1982).

However, to extract meaningful information from the complexity of audio files applying neural networks (see section 4.1.2.1), it is advantageous to employ STFT to reconstruct the individual components of the audio track. The STFT

algorithm creates a temporal representation throughout the audio signal. Revealing the specific constituent frequencies generates additional important data points as input for neural networks.

The most common data formats in audio elements are WAV or MP3. Yet, no relevant results were obtained through website crawling. Thus, the subsequent explanations pertain to the analysis of audio tracks within video elements. Concurrently, this is a significant insight for the application of the OSMI, as it can be ascertained (albeit not with 100% accuracy) that simple audio files are scarcely utilized. This finding aligns with previous manual outcomes (see section 5.1.2). Still, OSMI indicators such as A3 do not necessarily dictate how sounds are employed. Consequently, this indicator is also applicable to other types of media.

5.2.3.2. ***Audio-Content-Analysis***

The audio analysis in this work aims, among other objectives, to identify positive emotions that tangent the consumer. As previously described, audio files comprise diverse components. This complexity makes it nontrivial to deduce a direct indication for the OSMI as a sensory evaluation solely based on factors such as the amplitude's magnitude (high or low) and its impact on sensory perception in the digital consumer journey. A moderating variable on an aggregate level could be the specific industry in which the audio file is used to promote a product. Therefore, it is not self-evident that a heuristic in the sense of a "the higher, the better" approach could be applied to the analysis and evaluation of audio files, which is also a restriction due to the limited resources within this dissertation.

As a consequence, keyword extraction can serve to understand the speaker's emotions, whether from audio or text, and the following explanation of the approach will focus on the latter. In this context, within the scope of the OSMI Indicator A4, the spoken content in audio format can be systematically analyzed to determine whether the spoken text is generally to be evaluated as positive or not. For the extraction of text from audio files, there are once again several services available through Google and AWS Transcribe. Both methods were experimentally tested and yielded suitable extraction results without data preprocessing.

To enhance the performance of these tools, it is also possible to separate the speaker and background noise into distinct audio tracks beforehand. Firstly,

dividing the frequency range by creating two masks for a single audio track is feasible. The speaker's voice should be accurately assigned to one of these masks, while all other frequencies are classified as background noise. Additionally, utilizing pre-trained neural networks is also an option. All three options - no preprocessing, preprocessing through masking, and preprocessing using a pre-trained CNN - were tested and compared. As a result of student tests supervised by the author of this dissertation, it was determined that the most efficient approach is to neglect preprocessing for speech recognition, as these steps did not benefit the quality of the retrieved texts.

Consequently, the analysis of audio tracks can be conducted based on transcribed texts, like regular text analysis. Individual words are examined in this process, and an average value is computed for the entire transcribed text. However, it is essential to note that the textual output of the test investigations lacks punctuation marks (analogous to previous text analysis) and a logical sentence structure. Therefore, analyzing contextual relations, e.g., with BERT, is impossible. Regardless, it cannot be ruled out that this might also be possible with special codes or applications. Due to these considerations and the absence of audio files on websites, this chapter primarily described the general procedure for audio analysis. As a result of the mentioned restrictions, this approach has yet to be implemented in the automated OSMI due to its current limitations.

5.2.4. Video-Based Sensory Analysis

A video file is a straightforward concatenation of images at a constant resolution, occurring at regular intervals (e.g., 24, 30, or 60 frames per second). In contrast to images, videos introduce a temporal dimension, to which optional auditory elements can also be incorporated. This subchapter addresses the resulting video retrieval and analysis requirements within the OSMI scope.

5.2.4.1. Video-Retrieval Process

The fundamental concept of video retrieval also corresponds to the image retrieval process presented in Figure 16. Similar to audio files, video elements possess specific characteristics that require consideration.

As mentioned earlier, the OSMI proposes to include a company's entire e-commerce online presence in the evaluation process. However, since the extent of this presence varies greatly from company to company, a specific crawler to be developed must also be able to take a subset of it into account if necessary.

First and foremost, it must be noted that some companies embed videos on their website that are hosted externally, for example, on platforms like YouTube. These embedded videos are given temporary IDs within the HTML code, which, as of the current state, cannot be fully automated to trace back to the original video. Other variations are possible where a file URL is not visible upon embedding. However, these cases are currently inaccessible for all conceivable crawling methods. Consequently, it is only feasible to retrieve directly hosted video content.

When crawling a website is permitted, all video files are located. Various approaches exist to account for the considerable diversity in existing website structures. The identification of video content need not necessarily follow a consistent pattern. On one hand, there are universally applicable HTML tags, such as those within a <video> tag, making video retrieval relatively straightforward. On the other hand, companies also have the option to classify their videos autonomously and individually. Therefore, tags can be included as a singular level or nested within each other. To ascertain the presence of a video, automated exploration must determine whether the link to a video is embedded within the tags or a tag parameter, potentially spanning multiple levels. If video embedding occurs at the parameter level, terms like "src" or "source" are often used, though this is not a strict rule, and custom designations are possible (Vural et al., 2014). This complexity in video retrieval presents challenges and could be overcome through extensive training of a dataset covering most of these name-related variations. In the scope of this research, only individual videos were retrieved and analyzed in a sampling manner, as additional immense computational power would have been required beyond this.

5.2.4.2. ***Video-Content-Analysis***

Video analysis poses a distinct challenge to the analysis process within the OSMI due to the substantial volume of image data involved. Given limited capacities, the subsequent discussion mirrors the process for audio elements,

outlining the necessary steps to evaluate OSMI Indicator H5 (product video) in terms of an e-commerce website. In video analysis, all the distinct analytical aspects of textual, visual, and audio-related content of e-commerce websites ultimately converge, as video content typically encompasses all three domains within a singular format. The file format can be MP4, MOV, WMV, or AVI, among others.

Compression algorithms ensure that the concatenation of images displayed in a video does not result in an immense file size. This is achieved by not redundantly storing information, much like in the case of images. However, for processing by an AI related to OSMI evaluations, it is necessary to examine a video frame by frame. Hence, additional processing effort is required to extract these frames from the video file (Sharma et al., 2021). The often-present audio track within video files is separated from this description, extracted during retrieval and preprocessing, following a procedure analogous to the previous section 5.2.3.

The processing of a video file through extraction into individual images can be achieved using the Python library cv2. This application is built upon the well-known video processing software OpenCV (Guillen, 2019). It provides the VideoCapture class, which utilizes the "read" function to output and save each video frame. The user can configure the storage to either occur as numerical arrays, where each element represents a pixel, or conventionally as an image file.

Depending on the requirements, further preprocessing steps may be necessary after this initial video-processing step. For instance, the existing color spectrum can be reduced by aggregating into broader color ranges or converting to grayscale. The latter provides the analytical advantage of reducing the video to dimensions of time, X-coordinate, and Y-coordinate. However, this is counterproductive for the present objective, as the OSMI tends to include the colors used in videos as part of the evaluation. Therefore, this step is not pursued further.

To facilitate a dedicated analysis of video content within the scope of OSMI Indicator H5, a connection to the advertised product must be established based on the textual, image, and audio components. However, knowing exactly which product is being promoted in each video would be necessary to provide precise information. Due to the nature of data collection, the only information available is the company associated with the video. As an approximation for distinguishing products, industry classification can be added as metadata.

5.2.5. Interactive-Media Analysis

This section investigates whether it is possible to analyze the presence of interactive media, as depicted in OSMI Indicators 3D product visualization (H4) and Virtual try-ons (H6), through computer vision methods. Both indicators generally focus on the presence of interactive sensory elements and their functionality, which renders crawling and downloading unnecessary.

Several approaches can be used to scrape specific multimedia elements from a website, which can be employed to classify or determine the presence of a multimedia element on an e-commerce website. One method involves utilizing the Selenium WebDriver (SWD), designed to emulate and inspect whether web pages perform as intended (Bruns et al., 2009). The Selenium WebDriver operates in three stages. Firstly, each browser has its own driver, initializing the server before executing test cases. Based on this, the JSON Wire Protocol translates test commands into HTTP requests. Finally, the request is received by the browser's driver, allowing for an analysis of the code to be performed (Gojare et al., 2015).

In the current scenario, the SWD can be employed by converting the webpage with the 3D visualization into text to analyze whether the code consists of keywords common to sensory-related e-commerce content (Arya & Verma, 2014). This could be, for instance, *"360productviewer"* or similar terms. Appendix 7 displays an excerpt of the code, demonstrating how such a search can be conducted based on the HTML code of the target website. However, regarding H4, it should be noted that in the present test, only the presence, but not the degree of interaction, can be determined, which is currently a limitation but could potentially be addressed through targeted further programming of the scraping process.

While SWD is a burgeoning tool that potentially can recognize specific multimedia elements, there is an additional challenge stemming from the website structure. This challenge arises from detecting and classifying different multimedia elements, similar to video elements, which do not necessarily adhere to a predefined structure in the HTML code. Accordingly, the naming of interactive assets remains subject to entrepreneurial discretion.

An alternative identification method could involve using a pre-trained CNN to recognize interactive sensory content based on visual features. However, for this

approach, extensive image analysis and potentially integrating computer vision libraries would be required a priori. Due to the limited capacities in this dissertation, this step was foregone, especially since it is not definitively predictable whether a textually analytical method would outperform a machine-learning-based approach. Furthermore, it is not definitively predictable whether a textually analytical method would perform worse than a machine-learning-supported approach, given the basic lack of standardization in multimedia content and the anticipation that some level of customization could be regarded as a competitive advantage. Thus, it can be stated that the automated recognition of interactive sensory content is generally feasible but currently comes with certain limitations.

5.2.6. OSMI Automatic Calculation

This section concerns evaluating automatically derived OSMI scores to investigate their practicability. Considering the diverse challenges and restrictions described earlier, the image-based OSMI indicators G3 (color schemes) and V6 (contrast) were initially assessed. On the other hand, text analysis, with indicators H1, O1, A1, G1, and V1, forms the analytical core of the automated approach. Based on assessments of these five indicators, automated OSMI values were calculated and are listed per industry in Table 27 based on 116 websites that were retrieved.

The results reveal that the unweighted OSMI scores in the automotive industry, for instance, experienced -17.06% (⌀). However, the best parameter scores without weighting were assigned to the sense of sight at .75 and the sense of taste at .73 (Volvo). The significance of the latter value decreased due to its low weighting. An analysis of the absolute frequencies of input words obtained through text analysis disclosed that the automotive industry exhibited a strong technical affinity in sensory consumer communication. This observation aligns with the findings of the manual analysis, as evidenced by the frequent use of words like "drive" (n = 164), "system" (n = 128), "performance" (n = 58), "technology," and "engine" (n = 55). In contrast, sensory terms such as "dynamic" (n = 50), "active" (n = 42), "experience" (n = 40), and "emotion" (n = 24) were less commonly used. Analyzing TF-IDF evaluations based on GloVe cosine similarity, it was found that sensory terms like "fruit" (TF-IDF: -.00021) and "fresh" (TF-IDF: -.00047) were associated with the gustatory sense on Alfa Romeo's website. Interestingly, "fresh"

Table 27. Results of OSMI Automatic Evaluation

Industry	*Companies*	*Ø-Haptics*	*Ø-Olfactory*	*Ø-Acoustics*	*Ø-Gustatory*	*Ø-Visuality*	*OSMI*	*OSMIw*	*abs. Var.*	*rat. Var.*
Automobile	*4*	*.57*	*.66*	*.53*	*.54*	*.68*	*.59*		*-.10*	*-17.06%*
		.08	*.07*	*.12*	*.02*	*.20*		*.49*		
Cosmetics	*18*	*.60*	*.66*	*.64*	*.55*	*.64*	*.62*		*-.15*	*-24.25%*
		.11	*.12*	*.08*	*.02*	*.15*		*.47*		
Fashion	*14*	*.46*	*.57*	*.43*	*.43*	*.59*	*.50*		*-.09*	*-18.42%*
		.09	*.06*	*.05*	*.02*	*.18*		*.41*		
Food	*26*	*.57*	*.62*	*.59*	*.64*	*.65*	*.62*		*-.15*	*-23.77%*
		.05	*.09*	*.08*	*.09*	*.16*		*.47*		
Healthcare	*4*	*.61*	*.68*	*.62*	*.58*	*.74*	*.65*		*-.09*	*-13.25%*
		.06	*.09*	*.10*	*.07*	*.25*		*.56*		
Household	*6*	*.53*	*.57*	*.52*	*.49*	*.60*	*.54*		*-.09*	*-16.95%*
		.06	*.07*	*.14*	*.02*	*.16*		*.45*		
Interior	*4*	*.64*	*.69*	*.55*	*.65*	*.70*	*.65*		*-.13*	*-20.81%*
		.11	*.07*	*.10*	*.02*	*.21*		*.51*		
Leisure	*2*	*.61*	*.66*	*.58*	*.63*	*.72*	*.64*		*-.11*	*-17.78%*
		.09	*.05*	*.14*	*.04*	*.21*		*.53*		
Lifestyle & Jewelry	*8*	*.56*	*.69*	*.60*	*.57*	*.71*	*.63*		*-.12*	*-19.75%*
		.07	*.09*	*.10*	*.04*	*.20*		*.50*		
Technology	*26*	*.59*	*.63*	*.59*	*.55*	*.70*	*.61*		*-.09*	*-13.93%*
		.08	*.04*	*.17*	*.02*	*.21*		*.53*		
Vacation & Travel	*4*	*.59*	*.69*	*.60*	*.62*	*.74*	*.65*		*-.13*	*-19.36%*
		.07	*.09*	*.13*	*.04*	*.20*		*.52*		
	Σ= 116	*.58*	*.65*	*.57*	*.57*	*.68*		*Ø*	*-.11*	*-18.67%*

was used twice as often as "fruit." However, the word "fruit" appeared in a sentence from Alfa Romeo that did not intend to evoke gustatory perception: "*The excellent driving dynamics of the Alfa Romeo Giulia are the fruit of specific design choices.*" In contrast, the fashion industry had an average OSMIw value of .41, which corrected the original (unweighted) values by -18.42% (d = -.09) due to a significantly higher weighting of the acoustic parameter than the automotive industry. In the manual

analysis, haptics was classified as the most vital parameter, which was reflected in the automatic analysis by an average rating of .46/.09 (weighted). The text analysis revealed that the fashion industry primarily focused on factual communication, as indicated by the frequent use of terms like "order" (n = 231), "size" (n = 149), "return" (n = 141), "store" (n = 132), and "item" (n = 117), which describe the purchasing process rather than strongly appealing to the senses. However, more sensory-associated terms like "create" (n = 28), "choose" (n = 27), "discover" (n = 20), and "experience" (n = 16) were also utilized, albeit slightly less frequently than in the automotive sector, despite analyzing ten more websites in this sample. According to the determined weighting, the fashion industry played a minor role in olfaction and gustation. Nevertheless, the AI-based method yielded excellent values for both parameters. For instance, the olfactory parameter is characterized by tokens like "floral" for the brand Gant (TF-IDF = -.00045) and "fragrance" for Tommy Hilfiger (TF-IDF = -.002445). Fragrances were mentioned exclusively in the context of lifestyle products (perfumes) alongside the core business of fashion brands. The term "floral" also related to the garment pattern but had cross-modal olfactory imaginative effects.

In the food industry, weighting was the strongest compared to other industries. To compensate, haptics and acoustics received higher weights. Word frequencies indicate that "ice" was the most frequently used term (n = 408), while "flavor" (n = 186) and "food" (n = 147) appeared less frequently. However, terms like "humor" (n = 118), "love" (n = 111), "people," "share" (n = 96), and "family" (n = 93) emphasized the social nature of food. Furthermore, terms like "delicious" (e.g., Senseo, TF-IDF = -.00052) and "fresh" (e.g., Starbucks, TF-IDF = -.00050) were associated with taste. It is worth noting that the term "fresh" can be associated with different senses. While it was predominantly linked to taste and smell in the food industry, it was connected with sight in the fashion industry. In comparison to the manual analysis, which often considered the olfactory sense weak or not evaluable, the automatic analysis showed that some tokens contribute to the good parameter values in the OSMI calculations. This included taste, and terms like "rich" (e.g., Nescafe, TF-IDF = -.02144), "morning" in relation to coffee products (also Nescafe, TF-IDF = -.02147), and "refresh" (e.g., Pepsi, TF-IDF = -.01082). In the technology sector, the automatic approach identified "service" (n = 800), "data" (n = 790), "product" (n = 691), and "business" (n = 660) as the most frequently used words.

Among the top 15 words, "solution" (n = 585), "support" (n = 438), and "customer" (n = 352) were also prominent. However, the gustatory and olfactory senses received lower weights in the OSMI assessment for the technology industry. Nonetheless, the average OSMI values were moderate and significantly improved compared to the manual analysis. In conclusion, the analysis indicates that the technology industry primarily focuses on solving customers' problems through communication, where the product serves as a means to fulfill and address customers' needs and desires.

The findings indicate that the OSMI approach generally can be improved by implementing AI methods. Although different NLP methods were utilized, the results obtained via GloVe and Word2Vec were similar in many respects. The GloVe method showed suitable values for the auditory sense, while Word2Vec excelled at the sense of taste. In contrast, the cosine similarity approach provided more robust and plausible results than in the Euclidean distance case. For the sense of hearing, the results of GloVe stood out, as descriptive words such as “immersive,” “astonish,” “loud,” “pleasant,” or “uplifting” were recognized. In comparison, Word2Vec found appropriate nouns related to the sense of hearing, such as “noise,” “speaker,” or “headphone.” For the sense of taste, the words “delicious,” “tasty,” “sweet,” or “roast” were more prominent in Word2Vec than in GloVe. The GloVe model sometimes used misleading terms such as “graveyard.” Regarding the sense of hearing, Word2Vec primarily detected nouns as the best-associated words. Related to the sense of touch, both GloVe and Word2Vec had difficulties identifying relevant, descriptive words. Lastly, the OSMI automatically determined by the TF-IDF procedure reflects a large part of Kilian's (2010) listed weights in the form of a high value of the respective parameter. For example, sight gained the highest overall importance with an unweighted OSMI value of .68. On the other hand, taste was the least important and had the lowest OSMI value at .57 but shared this score with the auditory parameter. Overall, the determined OSMI values of the individual parameters based on TF-IDF, especially for olfactory, acoustic, and gustatory senses, were significantly higher than in the manual analysis. This is because key terms of atypical senses for the respective industry were rated well (e.g., the gustatory sense in the technology industry). Nevertheless, the text-based analysis indicates several insights into the use of multisensory communication on the studied websites.

5.2.7. Discussion

This machine-based sensory analysis chapter delved into how the manually devised OSMI assessment approach can be automated for identifying, extracting, and evaluating online sensory marketing assets, incorporating AI and Big Data methods (RQ6a). For this purpose, the primary text and image content types were examined, along with audio, video, and interactive elements, within this study's available technical and temporal constraints.

The data acquisition from the companies' websites proved challenging, as each website has a distinct structure, differing levels of HTML complexity, and the autonomy to permit or deny crawling. Crawling remains the sole reliable method to retrieve information from websites lacking explicit endpoints. Consequently, data retrieval was comprehensive for text and images but proved challenging for audio, video, and interactive elements. Therefore, these elements were only examined on a sampling basis.

The data analysis itself revealed the necessity for diverse preprocessing and analysis methods. For instance, text analysis underwent extensive preprocessing, including stemming, lemmatization, and stop word removal. This prepared the text for word embedding techniques and subsequent transformer application, yielding a measurable metric (TF-IDF) that provided insights into online sensory communication. The image analysis also proved demanding, requiring significant computational power for tasks such as automatic object recognition, label analysis, face and emotion recognition, and text extraction from images using AI methods.

Hence, the results for each content type originated from distinct calculations. RQ6a can be affirmed in principle by demonstrating the feasibility of automated sensory content analysis for e-commerce websites. However, achieving this requires a substantial Big Data infrastructure to automate each step. The OSMI automatic evaluation approach further supports this notion, although additional optimization loops of varying intensity are necessary for translating AI analyses per content type into robust outcomes. In conclusion, it can be generally affirmed that, within the current constraints, automated OSMI determination is achievable but requires significant coding solutions and computing power. Despite these limitations and given the overall goal of a concept-based artifact, the following discusses the design process of a mock-up that embeds the results of this chapter.

5.3. DESIGN-APPROACH BASED ON EXPERT INTERVIEWS (ARTIFACT II)

In the context of a scientific research project following the Design-Science-Research methodology proposed by Hevner et al. (2004), the development of a clickable mock-up prototype was undertaken. The purpose of this research phase is threefold: firstly, to address the previously identified need for measurement and evaluation of sensory e-commerce content; secondly, to explore the potential integration of automated AI methods into a visual representation to meet this demand; and thirdly, to assess the feasibility of implementing these findings into a tool that can be effectively utilized by marketing professionals and managers.

5.3.1. Implementing required Characteristics

To ensure the relevance and effectiveness of the artifact to be developed, the requirements of the problem environment, precisely the needs of marketing managers in the e-commerce domain, were carefully considered (see section 4.2.3). These insights regarding essential tool requirements were derived by SSIs with experts in the field. During the interviews, the business's need for an assessment tool that can effectively measure and evaluate the sensory aspects of e-commerce content was confirmed.

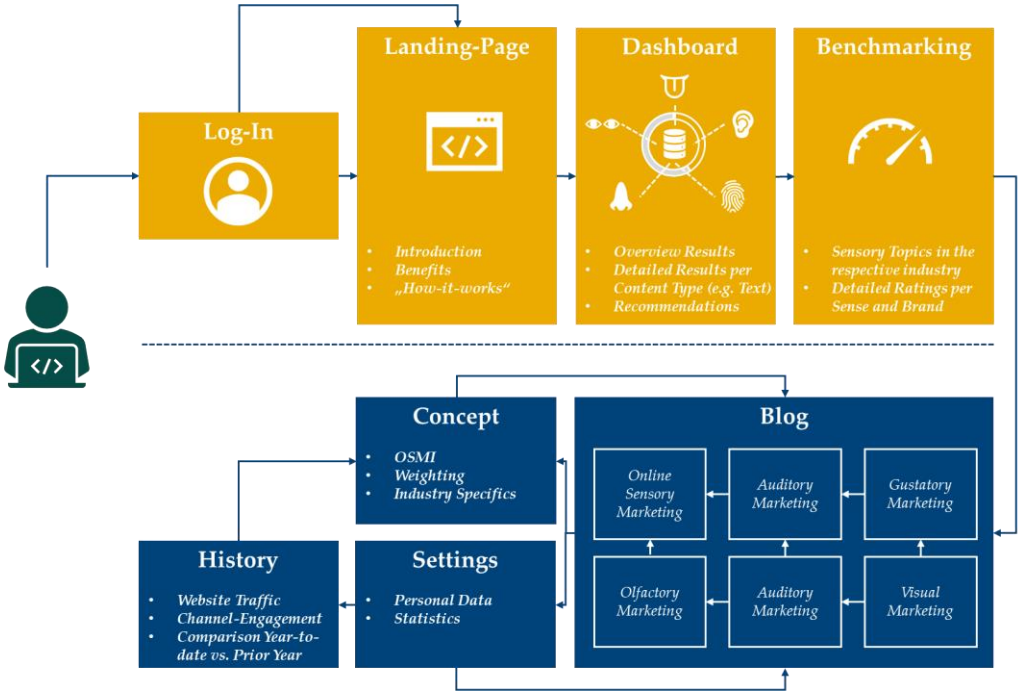
Consequently, in the subsequent stages of the research project, the focus shifted towards the design and development of the prototype, guided by the identified requirements. The requirements, derived from the qualitative content analysis (Mayring, 2000) of the input from the eight experts in the first round of interviews to identify a business need, were categorized into three main aspects. First and foremost was the usability and design of the tool, emphasizing a simple and easily understandable user experience (ease of use) with a clear dashboard and log-in functionality. Additionally, the information content of the tool to be developed was deemed essential, representing general scores per sense and individual scores per indicator, such as texts, images, videos, etc. Furthermore, recommendations were identified as a crucial informational aspect that the artifact should provide. According to the SSIs, the third and final pillar of requirements was the comparability function, which should enable comparisons between direct

and indirect competition and between recent and older analysis results of the sensory communication quality of one's own e-commerce website.

To implement these requirements into an artifact, it was necessary to visually represent the results obtained from the previous analyses in a realistic atmosphere, also referred to as a "tool" and "prototype" interchangeably in this context. Due to resource constraints, developing a fully functional software was not feasible, so it was decided to develop and showcase the prototype based on a specific case study. For this purpose, the company Nespresso from the food industry was chosen as an exemplary case, as it had been previously analyzed.

The characteristics of such a sensory evaluation tool are depicted in Figure 23. This graphic illustrates the initial planning process, which was visualized before creating the clickable prototype. The basic structure followed that of established tools for other analysis purposes (see similarweb.com, for instance). Please note that not every single interaction is integrated into the illustration below for visual clarity, and the yellow boxes represent focus sub-pages of the tool that are of priority for analyzing websites with a sensory focus, as mentioned by the experts.

Figure 23. Required Prototype Characteristics retrieved from the SSIs



5.3.1.1. ***OSMI Prototype UX-Design***

The development of websites, apps, prototypes, and other digital design-related aspects is facilitated by modern design software tools such as Adobe XD, Axure RP, or Figma. Among these, Figma, in particular, is gaining increasing popularity among UX and UI designers worldwide (Staiano, 2022). Figma enables quick visualization of ideas and step-by-step refinement of designs without the need to modify the HTML code. Additionally, users can easily share their prototypes, thus strengthening collaboration between designers, developers, clients, and agencies (Bexiga et al., 2020). As an added bonus, Figma can even serve as a replacement for PowerPoint or Illustrator (Schwarz, 2023). Hence, Figma was chosen as the primary tool for UX design and prototype creation in this research phase due to its wide acceptance and comprehensive feature set. The platform independence of Figma ensured compatibility across different devices and operating systems, facilitating the broader prototype accessibility via web browser and making it the ideal choice for this dissertation project.

Wireframes, which are skeletal representations of a software´s user interface (Schwarz, 2023), were initially considered but deemed insufficient in capturing the interactive nature of the envisioned tool. Therefore, the decision was made to prioritize the development of an interactive prototype, as it would provide a more tangible and immersive experience for the users, particularly the experts, who are asked to test, review, and rate the prototype according to the categorization of the SSIs based on the UEQ questionnaire. The results will be discussed in section VI.

To ensure a consistent and responsive design, Figma's responsive layout grid feature was utilized first. Following the guidelines of the Bootstrap standard (getbootstrap.com), the prototype would be easily adaptable to different needs in the future (e.g., different screen sizes and devices). The Bootstrap standard provides specific guidelines for the grid structure required to use Bootstrap 5. The container width is set at 1320 pixels (px), with a gutter width of 1.5rem (24px, with .75rem on the left and right sides). A grid system facilitates more consistent design across frames, which is the specific naming for individual sites within the prototype. Subsequently, a row layout is also defined, and it is recommended to utilize clear paddings. This means placing elements at a consistent spacing of 8px by default to avoid the necessity for manual and time-consuming measurements in

future developments (Schwarz & Kearney, 2019), as intended in the phases after evaluation of the OSMI prototype (see chapter VI), which is outside the primary scope of this dissertation. Nevertheless, the dissertation´s artifact should be prepared to be set up in a business environment as comfortably as possible by following those above and common UX-design standards. Another advantage of the platform is that all elements in Figma are vector-based and can be scaled without any loss of quality (Pacheco et al., 2021).

The qualitative content analysis has resulted in an inductive approach to the domain of UX design. In line with these findings, the following subsections delve in detail into the ease of use, introduce the dashboard, and visualize the log-in area.

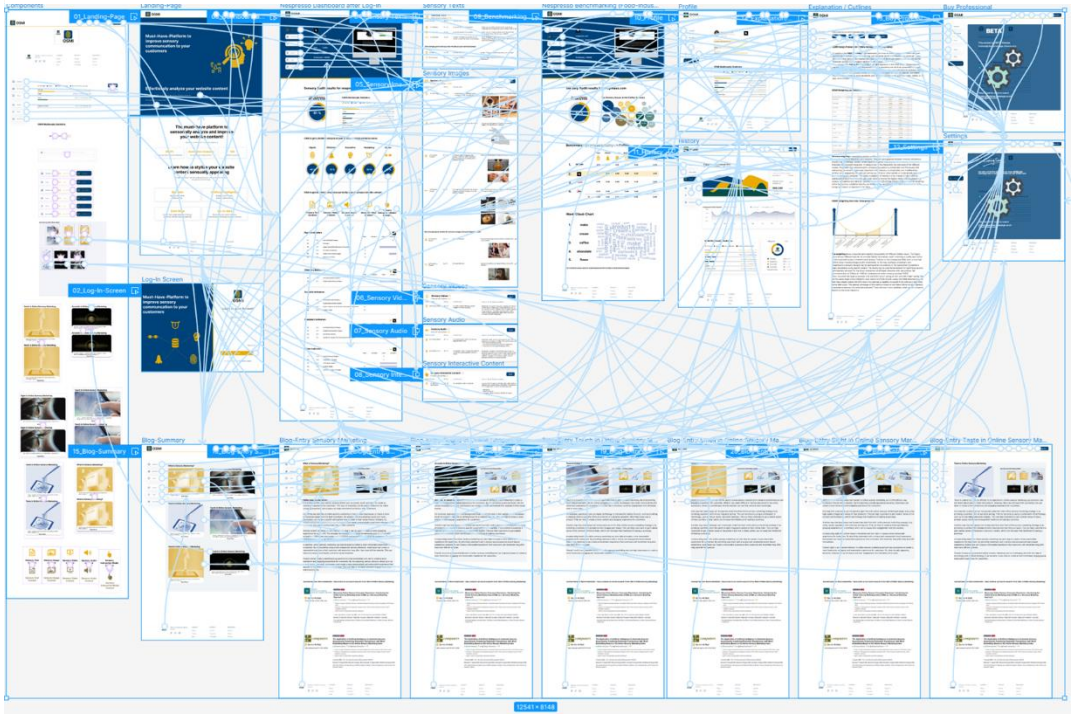
5.3.1.1.1. OSMI Prototype Ease of Use

During the prototype development process, a range of design elements and considerations were incorporated to create an engaging and functional user experience. Initially, foundational constraints were incorporated to maintain a consistent and coherent design approach throughout the prototype (Staiano, 2022).

An integral aspect of an interactive prototype is the implementation of buttons. These buttons provide interactive functionality, empowering users to initiate specific actions and navigate within the application. To enhance the user experience and bring it closer to a realistic setting, Figma also offers the capability to design a hover function for buttons and other design elements. Hovering was consequently employed, particularly in the case of buttons, where they assume a different color scheme upon hovering, symbolizing that clicking on the respective button will result in redirection to a result or another element. After the click, the button transitions to a graphic design specially developed for this state. As a result, three distinct graphic types of buttons were created, which were automatically applied by the variant feature in Figma. For the hovering effect, the smart animate function was utilized, employing an ease-out animation lasting 300 milliseconds.

Navigation elements, such as menus and links, allow users to navigate through various sections of the prototype, which will be covered in greater detail in the subsequent sections. These linkages collectively contribute to maximizing the interactivity of the tool. Figure 24 depicts the prototype view that illustrates interactions between individual frames, represented in blue lines.

Figure 24. OSMI Prototype Ease of Use (UX-Design)



On the left-hand section of Figure 24, the variants are displayed, which are revealed based on the hover status. This frame is not visible to experts in the prototype's test version itself. Nevertheless, numerous initial paths from this frame extend in the interaction view, which is essential for enhancing the ease of use. Additionally, in this frame, developed and applied auto-layouts are situated (Schwarz, 2023), such as the navigation bar and sidebar, which are automatically implemented on every page except for the landing page and the log-in field. Following this logic, emphasis was placed on simplicity, clarity, structure, and interactivity, ensuring that the user consistently knows his location and can comfortably switch back to their point of origin in usage. The visual highlighting of the clicked button, either to the side or at the top of the navigation, simplifies the visualization of the current page.

Overall, careful consideration was given to prevent overwhelming the user experience with unnecessary effects or excessive information that could lead to sensory overload. This includes sliders, which are no longer used due to their outdated nature and potential negative associations (T. Green & Labrecque, 2023).

5.3.1.1.2. Dashboard

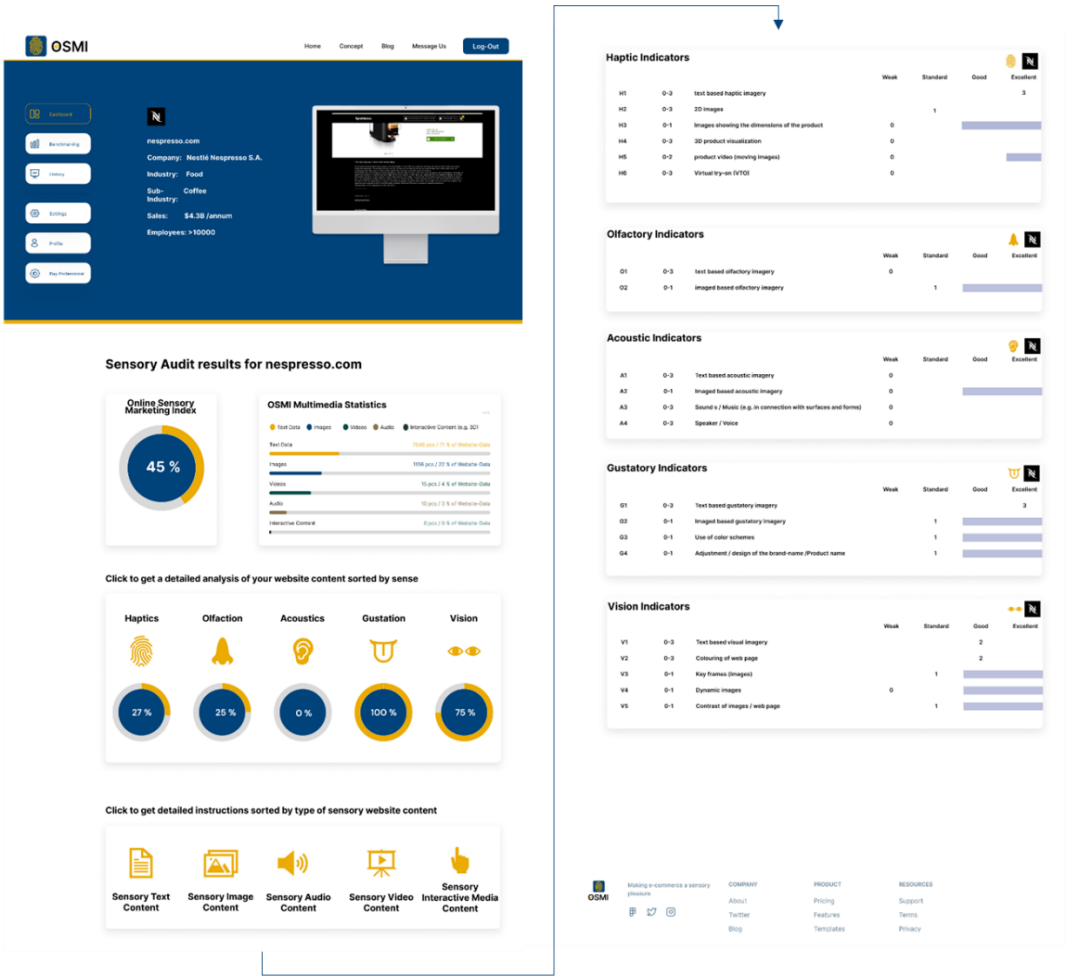
The dashboard, displayed in Figure 25, is designed based on the classical structure of comparable tools and design patterns for dashboards (Bach et al., 2023). The output, following the input and analysis of the target website, starts with general and essential data about the respective company or brand. Specifically, it presents information such as company size and number of employees. Although these details may be adjusted in later versions, they ultimately serve the overarching purpose of obtaining a size classification regarding the website's operator, analyzed from sensory perspectives. At the same level, a desktop PC positioned on the dashboard provides a preview of the website's landing page, where users typically initiate their on-site consumer journey. As mentioned before, the goal remains that the automated AI sensory analysis also considers sub-pages.

The analysis results are presented holistically following the company introduction on the dashboard. Initially, the website's OSMI score is displayed (in this example, Nespresso with a score of .45). Adjacent to the overall OSMI result, OSMI multimedia statistics are presented, which quantitatively provide an overview of the utilization of sensory texts, images, videos, audios, as well as interactive elements such as 3D or virtual try-ons. This is intended to offer the user an initial impression of the sensory design of the website that has been analyzed.

Furthermore, the partial results are structured and presented separately based on the senses. Clicking on the respective sensory icons directly leads to the detailed results related to the individual OSMI indicators, displayed further down on the same dashboard frame. As each OSMI indicator may use a different scale, a narrow or broader dark blue stripe appears on the feature expressions, representing the range the indicator cannot achieve. For instance, product dimension images may only differentiate between zero or one when fulfilled or not, but not between zero and three. This information is also communicated through the scale aligned to the left of the indicator abbreviation.

The dashboard layout is presented in Figure 25. For stylistic reasons of this dissertation, the figure has been split and shown side by side. In the mock-up itself, this is a single page that is scrollable and clickable. As mentioned earlier, however, virtually all elements that involve an analytical aspect are interactive and directly route the user to the desired content, rendering the page´s length disposable.

Figure 25. OSMI Prototype Dashboard



Moreover, the footer served as a section at the bottom of the dashboard and the other frames as well, containing additional information, links, and navigation options. A sticky header remained fixed at the top of the interface, providing easy access to navigation elements even when scrolling (Schwarz & Kearney, 2019).

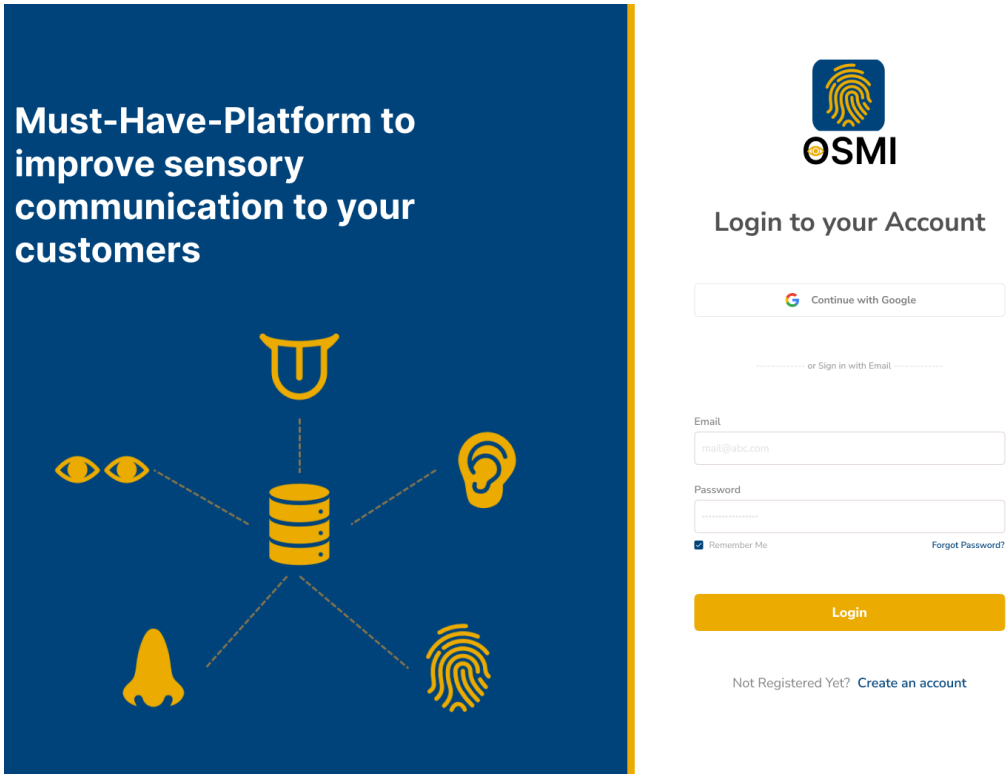
Equally integral to the OSMI dashboard is the section on examples and recommendations based on the sensory analysis of various website contents. For instance, clicking on one of the content icons below the OSMI sub-results will trigger a pop-up visual that precisely indicates which OSMI indicators have been met, along with specific indications, as well as corresponding recommendations. This will be further illuminated in the section on information quality (see 5.3.1.2).

5.3.1.1.3. Log-in (professional usage)

The login page is typically one of the initial screens encountered within an application (Schwarz, 2023). Accordingly, Figure 26 depicts the visualization of the OSMI Tool log-in, which, in the prototype version, remains non-functional but adheres to common standards. This encompasses features like the integration via Google account linking that would further enhance the user's convenience.

One of the side tasks of the log-in process is to convey the purpose of the application. Therefore, the OSMI logo is presented in a larger format. The logo consists of two senses relevant in the e-commerce domain, namely, haptic perception, represented by the fingerprint icon, and visual perception, represented by the eye integrated into the letter "O" of the abbreviation OSMI, which can also be interpreted as a sensory wheel for design purposes. Lastly, a catchy tagline conveys the tool´s essence and value proposition. Furthermore, frames were added for settings and blog posts, visible exclusively to logged-in users (see Appendix 9).

Figure 26. OSMI Log-In Sub-Page



5.3.1.2. *OSMI Prototype Information Quality*

The category of information quality derived from the SSIs is subdivided into the inductive domains of overall scores per sense and specific recommendations based on the sensory AI analysis. The implementation into the prototype of both subdomains is described below.

5.3.1.2.1. Overall Score per Sense

The overall sensory score, derived from the analysis of sensory e-commerce website components and the calculation method of the intermediate Artifact I (see section 5.1.1), is represented by the developed Online Sensory Marketing Index (OSMI). Thus, Figure 27 illustrates a segment of the overarching outcome for the sensory communication quality of the Nespresso brand, which is included in the dashboard shown in Figure 25. It is noteworthy that the OSMI, as previously elucidated, operates within a strict value range between 0 and 1. As a result, the analysis outcome can be reported either as a decimal value or as a percentage. In the prototype's visualization, the latter representation format was predominantly chosen for the purpose of clarity. This format intuitively conveys that the OSMI adheres to this value range. In theory, decimal values could be misinterpreted without further explanation, as they might exceed 1 or even become negative.

For the purpose of enhanced presentation, the unweighted OSMI was employed. This choice facilitates a more comprehensible depiction of the individual parameters comprising the OSMI. The weighting becomes primarily relevant later on for the overall evaluation of the OSMI, with less significance for

Figure 27. OSMI Score depicted in Dashboard Page

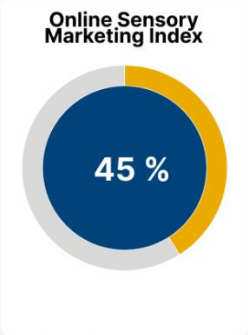
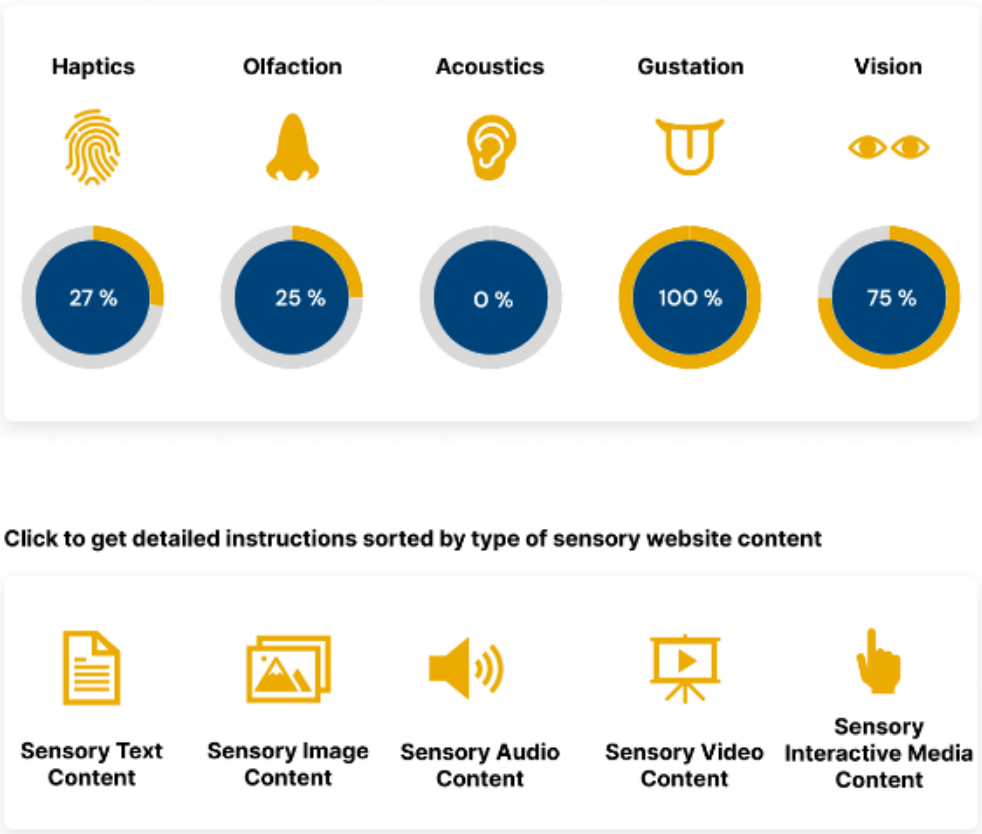


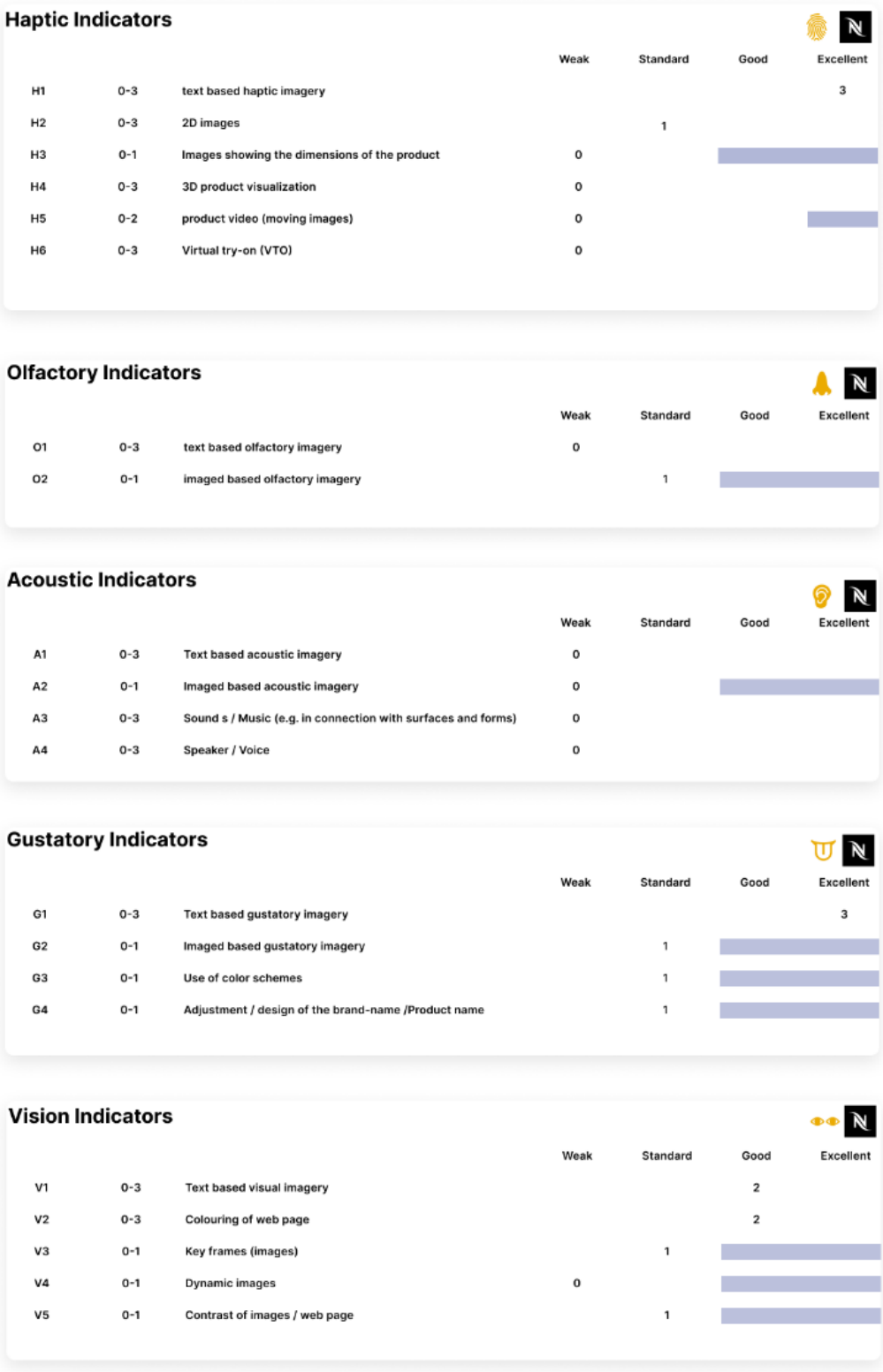
Figure 28. OSMI Scores per Sense



the individual senses. Mathematically, the resulting decimal values of the singularly considered senses become sufficiently small such that they are less useful for comparative intentions. Nevertheless, it should be considered that both weighted and unweighted values are depicted for the final implementation of the artifact. A slider could serve this purpose, allowing users to adjust it. Sliding the control to the right would convert the OSMI overall score and sensory parameter values into their weighted versions based on the corresponding industry.

Furthermore, Figure 28 presents the detailed results for the haptic, olfactory, acoustic, gustatory, and visual analyses. Clicking on each respective icon or value leads directly to the indicator result, as depicted in Figure 29. The lower segment of Figure 28 additionally displays the links demanded by the experts to individual actionable recommendations weighted in terms of the individual industry. These recommendations appear as pop-ups and are elaborated further in section 5.3.1.2.2.

Figure 29. OSMI Assessment based on Indicators



Haptic Indicators

			Weak	Standard	Good	Excellent
H1	0-3	text based haptic imagery				3
H2	0-3	2D images		1		
H3	0-1	Images showing the dimensions of the product	0			
H4	0-3	3D product visualization	0			
H5	0-2	product video (moving images)	0			
H6	0-3	Virtual try-on (VTO)	0			

Olfactory Indicators

			Weak	Standard	Good	Excellent
O1	0-3	text based olfactory imagery	0			
O2	0-1	imaged based olfactory imagery		1		

Acoustic Indicators

			Weak	Standard	Good	Excellent
A1	0-3	Text based acoustic imagery	0			
A2	0-1	Imaged based acoustic imagery	0			
A3	0-3	Sound s / Music (e.g. in connection with surfaces and forms)	0			
A4	0-3	Speaker / Voice	0			

Gustatory Indicators

			Weak	Standard	Good	Excellent
G1	0-3	Text based gustatory imagery				3
G2	0-1	Imaged based gustatory imagery		1		
G3	0-1	Use of color schemes		1		
G4	0-1	Adjustment / design of the brand-name /Product name		1		

Vision Indicators

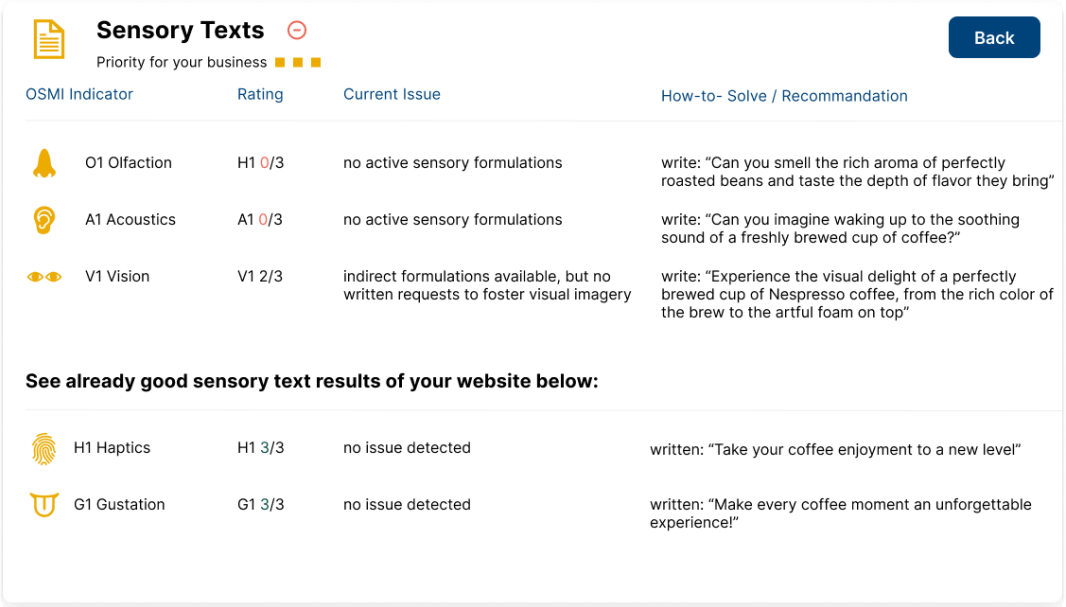
			Weak	Standard	Good	Excellent
V1	0-3	Text based visual imagery			2	
V2	0-3	Colouring of web page			2	
V3	0-1	Key frames (images)		1		
V4	0-1	Dynamic images	0			
V5	0-1	Contrast of images / web page		1		

5.3.1.2.2. OSMI-Specific Recommendations Based on Sensory Analysis

After clicking on the content-related icons, users are directed to the respective recommendation pages, displayed through a hover function on the dashboard. The following illustrations refer to specific OSMI indicators that were present or absent on the Nespresso website at the time of analysis. The latter automatically results in visualizing the unfulfilled OSMI indicators for each category of text, image, video, audio, or interactive content, accompanied by an example describing to what extent the indicator could be addressed. Therefore, recommendations are provided and differentiated based on the contents that can contribute to improving the sensory communication quality of the website when implementing the suggestions from the OSMI assessment prototype.

Figure 30 illustrates the initial pop-up window that appears upon clicking the sensory text symbol on the dashboard. The structure of these pop-ups is uniform across all types of content and begins by listing recommendations for content optimization. These recommendations are based on the analyzed OSMI indicators and their corresponding ratings. If the rating indicates the absence of an indicator, the number is displayed in red. In relation to this, the priority of the specific content

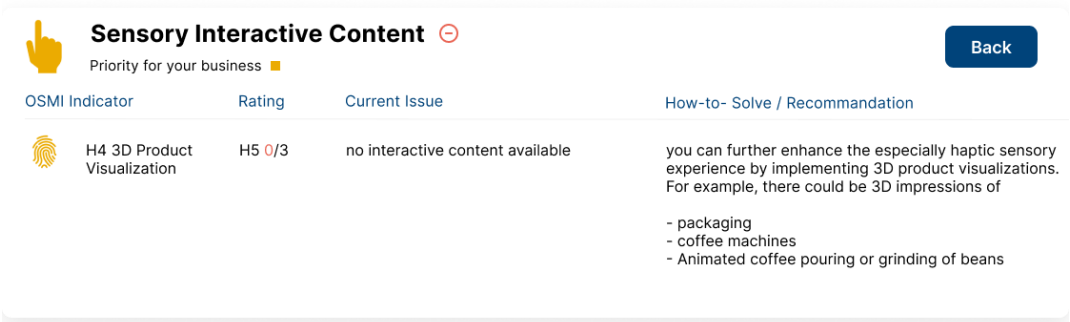
Figure 30. Pop-Up Sensory Text Analysis



is indicated according to the company and industry and clarifies the significance attributed to addressing these sensory communication potentials on the website.

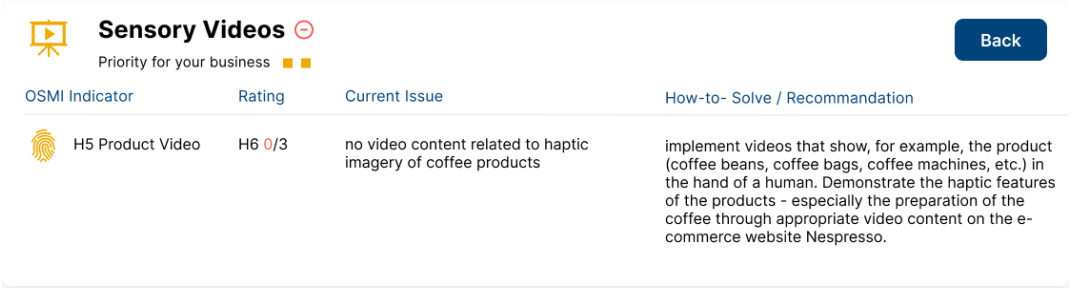
Figure 32, in contrast, displays the analysis outcome for the Sensory Interactive Content domain. It reveals that Nespresso has not yet implemented 3D product visualizations (Indicator H4 at 0). However, there is potential for employing them in the packaging and coffee machines categories. Similarly, animated motor actions like pouring or grinding coffee beans could be used to create a three-dimensional sensory experience emphasizing tactile sensations. Nonetheless, the priority assigned to this OSMI indicator is represented by its assessment of only one out of three possible bars. This indicates that it is more of an add-on feature rather than a must-have essential.

Figure 32. Pop-Up Sensory Interactive Content Analysis



The sensory video analysis, represented by Indicator H5 in relation to product videos within the OSMI assessment, is visualized in Figure 31. This pop-

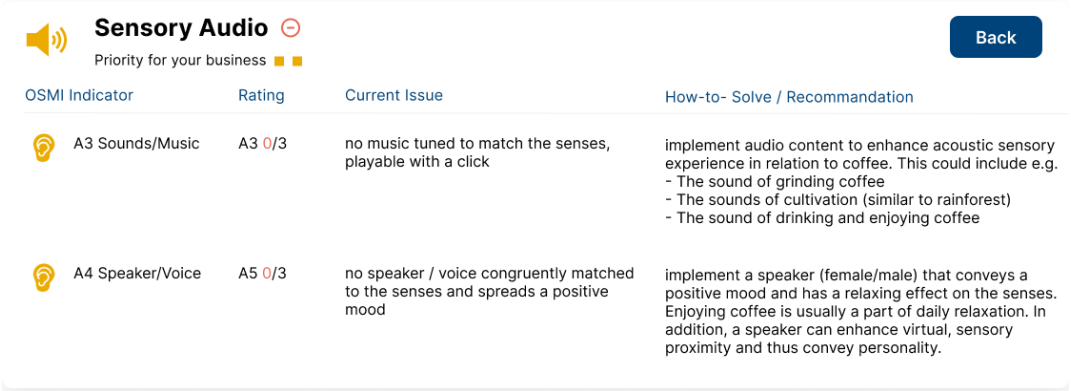
Figure 31. Pop-Up Sensory Video Analysis



up presents a similar scenario, as the examined website did not employ such elements at the time the assessment was undertaken. However, there is potential for incorporating videos that could, for instance, highlight the tactile features of the products by showcasing interactions with individuals. In contrast to the previous interactive elements, product videos are assigned a priority of two out of three points. This is due to their potentially more significant role in sensory (especially tactile) consumer engagement, particularly within the e-commerce coffee industry.

Figure 33, with the same priority, presents the outcomes of the sensory audio analysis. It was observed that neither the OSMI Indicator A3 (Sounds/Music) nor a spokesperson (A4) is utilized to emphasize product features and trigger sensory responses. Consequently, the recommendations highlight individual potentials for implementing sound that simulates actions like grinding or drinking coffee, thereby being closely related to the product while also conveying mood atmospheres. As outlined in section 1.3.3, this could prompt sensory imagination processes from the consumer's perspective, achieved by incorporating nature-like audio files with rainforest sound (e.g., in videos or clickable audio components).

Figure 33. Pop-Up Sensory Audio Analysis



Finally, Figure 34 summarizes the outcomes of the analysis concerning the images utilized on a website like Nespresso's. Given that images are one of the pivotal e-commerce components and are quickly grasped visually (Elder & Krishna, 2012; J. Park et al., 2005), particular emphasis should be placed on them (indicated by three points in the priority rating). According to the analysis, the examined website could pursue optimizations in several picture-related aspects.

Figure 34. Pop-Up Sensory Image Analysis (1/2)

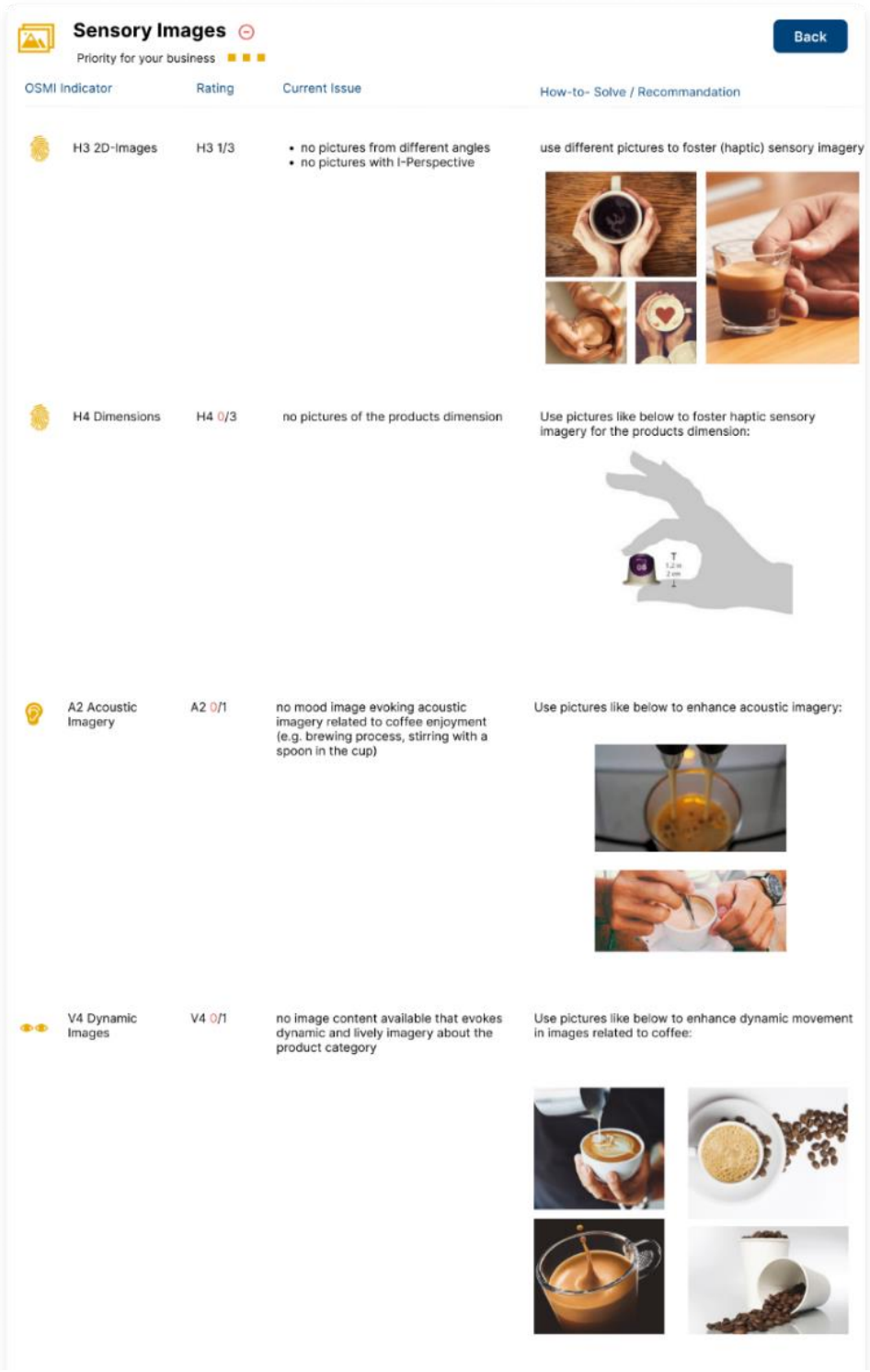
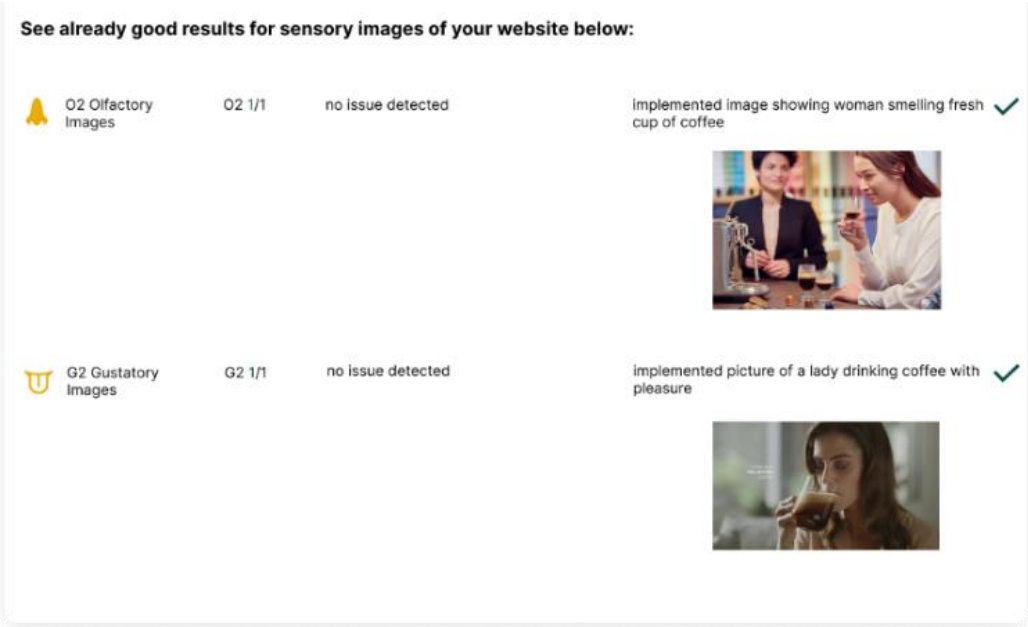


Figure 35. Pop-Up Sensory Image Analysis (2/2)



For the sake of clarity, the sensory image analysis has been divided into two sections. Firstly, the current issues (Figure 34) and already satisfactory results (Figure 35). It is notable that dividing the analysis by content type inherently implies departing from the sensory structure, unlike the previous recommendation pop-ups. Hence, different OSMI indicators can be grouped under the image category. The results reveal, in Figure 34, that in the fundamental 2D image content, there is a lack of images depicting products from various angles or from a first-person perspective. The prototype provides examples for improving this aspect. Moreover, dimensional images could be utilized to represent the size of coffee product capsules. This is in line with Jha et al. (2023) and also corresponds to the feedback from IP7 in the conducted expert interviews (see section 4.2.3). Dynamic images could also provide an additional lever for improvement (Roggeveen et al., 2015), and suitable images to address this issue are displayed directly as well.

However, if image content, as well as other sensory content, can already be classified as successful based on the OSMI assessment criteria, the specific asset of the website is displayed in the tool (Figure 35) and marked with a green checkmark.

*5.3.1.3. **OSMI Prototype Comparability-Function***

The third and final category that emerged inductively from the SSIs is the one related to a comparative function, which is divided into two subcategories. On the one hand, the eight experts unanimously considered it beneficial to have a separate dashboard alongside the regular one for their own analysis results of the sensory communication quality, allowing for benchmarking against relevant competitors. On the other hand, it was also deemed advantageous to have the ability to access historical results of both their own and their competitors. The implementation of these two subdomains within the OSMI prototype will be highlighted below.

5.3.1.3.1. Comparability related to competition

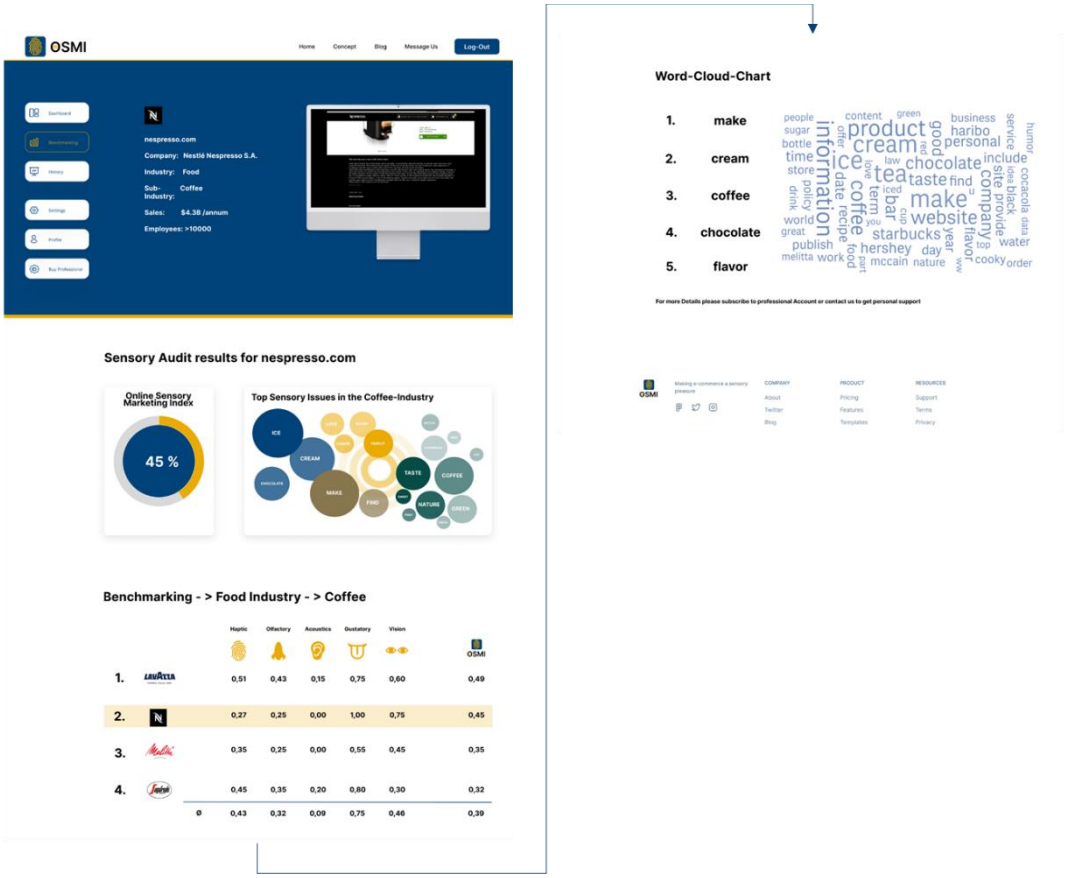
Benchmarking enables comparison with competitors. The sub-page of benchmarking, conveniently accessible at all times within the prototype through the sidebar, is illustrated in Figure 36. The button variations are highlighted once again, as the clicked sub-page is marked with a dark blue button with yellow outlines. At the same time, the selectable alternative pages are depicted in white.

The comparison with relevant competitors is automatically preselected based on the industry in which the examined company operates. Manual selection, both with regard to indirect competitors and desired comparison firms, could still be included in the finalized version. In the present example, the direct market is that of coffee, a subdivided market within the food industry. This subdivision is immediately displayed above the result table.

The result table itself is kept simple and reflects a descending ranking, which pertains to sensory e-commerce communication quality within the industry at the time of the assessment. For better contextualization, initially, only the first four results, including the relation of one's own results, are presented, with the latter highlighted with a yellow background. As can be seen, Nespresso ranks second behind Lavazza in terms of the OSMI Score.

In addition, for individual sensory appeals of each company, the partial results can be viewed and presented as decimal numbers, along with the averages of these values across all assessments. Additionally, the benchmarking includes, adjacent to the prominently visualized OSMI Score analogous to the dashboard, a thematic analysis based on sensory keywords in the form of a grouping graphic.

Figure 36. OSMI Benchmarking Sub-Page



Findings from the Nespresso example point to the relevance of factors like a connection to nature, interpersonality (love, family, humor), and gustation.

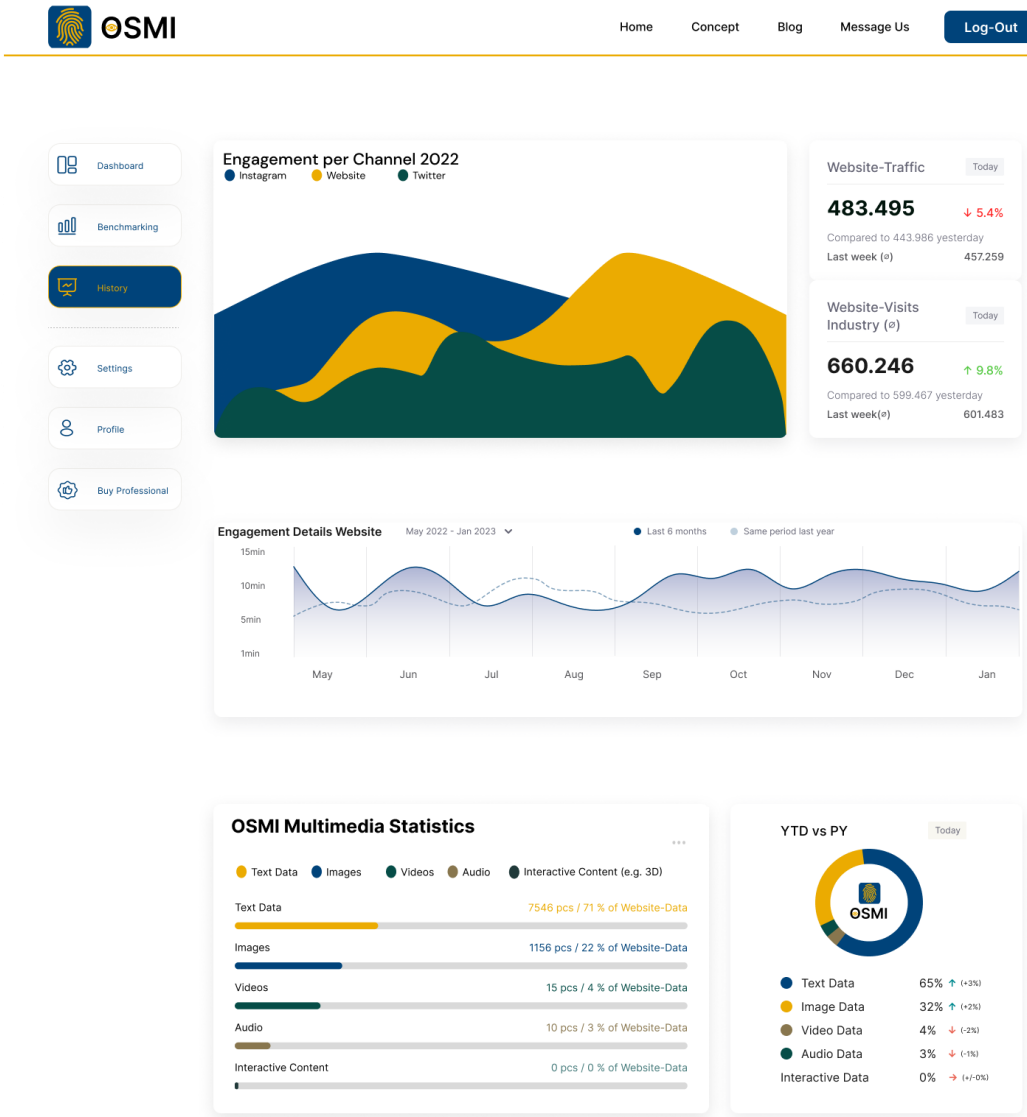
Finally, the benchmarking culminates with the presentation of a Word-Cloud Chart, which distinctly highlights the quantitative aspect of sensory terminology within the coffee market. This quantitative analysis is further complemented by the identification of the top five significant terminologies. In this specific case, these terminologies include, as expected, verbs like "make," which claims the first position, signifying the communication of sensory imaginations. Equally noteworthy are nouns such as "cream," "coffee," "chocolate," and "flavor."

In summary, the outcomes of the benchmarking process offer a potential avenue for enhancing and elucidating areas of sensory communication that may have been previously overlooked through comparative assessments.

5.3.1.3.2. Comparability related to previous (own) results

The last category involves the ability to contrast and compare the current results of a sensory content analysis with one's own and competitor´s previous data. Figure 37 visualizes this functionality, which would require integration with the log-in process. The values include metrics such as customer engagement across channels and over time, as well as traffic and descriptive sensory content checks.

Figure 37. OSMI Comparability Function Sub-Page



5.3.2. Testing the OSMI Prototype

The OSMI prototype mock-up underwent preliminary testing involving four different individuals in order to identify and address any potential issues related to user experience (see section 3.8) and other relevant aspects. This initial testing phase also aimed to gather valuable holistic feedback before proceeding to the evaluation round involving the eight experts (IP1-IP8) from the DSR environment phase, who confirmed the need for online sensory marketing assessments and were asked to provide expectations regarding a sensory evaluation assessment tool.

During the testing, several minor observations and improvement suggestions were noted, which were subsequently incorporated into the Figma-based mock-up before the second expert evaluation round. The feedback received included insights related to interactions that were misrouted or did not function as intended, as well as suggestions for enhancing the overall UX. By implementing the received prototype feedback, it was ensured that a more refined and optimized mock-up user interface preparation was set up to retain expert feedback to answer RQ7. Therefore, after incorporating the suggested improvements, the updated version of the artifact proposal was distributed to the experts for testing and evaluation.

5.4. DISCUSSION

The primary aim of chapter V was to rigorously follow Hevner´s (2004) Design Science Research (DSR) guidelines outlined in section 3.1 for the implementation phase in the following ways to answer RQ6b:

First, this work identified a business need within the DSR environment (RQ1) to assess online sensory marketing efforts with a particular focus on e-commerce. This chapter addressed RQ4 by conducting expert interviews from both the B2B and B2C sectors. It also involves performing a factor analysis to determine the relevant factors and criteria for sensory online communication and the consumer journey, specifically from a B2C perspective.

Next, a customized evaluation framework was developed to assess the sensory communication quality of websites. Initially, the Online Sensory Marketing Index (OSMI) was created manually, including a weighting proposal and an interpretation guide. The unweighted version of OSMI is calculated as the

arithmetic mean of the five parameters corresponding to the human senses and how they are addressed in the communication on the evaluated website. On the other hand, the weighted version of OSMI (OSMIw) is a composite score that accounts for the industry-specific criteria of sensory appeal. Both variants have a normalized value range between 0 and 1, enabling adequate comparability across evaluations and other websites or companies. In this respect, the manual OSMI approach (Artifact I) was tested by a field study with 16 websites that were investigated and evaluated manually. However, it should be noted that the interpretation and validation of OSMI values related to outcome variables like purchase intentions is beyond the scope of this dissertation, as it depends on various factors such as industry, company size, and language, among others. Nevertheless, the OSMI highlights indicators that are not only identified as necessary in the online consumer journey from a B2C perspective through the conducted survey but also serve as references in scientific research, where outcome analyses have been conducted for each indicator.

Moreover, this work investigated the feasibility of automating the analysis of sensory online content by applying various big data methods, particularly concerning online components such as text descriptions, product images, mood-related visuals, audio content, video content, and the identification of interactive website elements (e.g., 3D content, virtual try-on). The suitability of these sensory online contents for the intended assessment tool was examined through specific crawling, processing, and analysis methods. It was determined that suitable AI and big data methods exist for all content types, providing the potential to create an automated assessment tool that integrates all the separate investigations conducted in section 5.2. However, creating a fully automatically running software would require a combined big data infrastructure with detailed coding, server capacities, and integrated assessment techniques (e.g., AWS). Consequently, in line with RQ6b, the creation of such an infrastructure falls outside the dissertation´s scope.

Despite this, following the DSR guidelines, the user interface proposal was designed based on the DSR environment requirements from the SSIs (see 4.2.3). In the following chapter, it will be presented to the potential target audience of online marketing managers to obtain confirmation of Artifact II and enable its evaluation.

VI – EVALUATION

VI - EVALUATION

Within the first semi-structured expert interviews (see section 4.2), a need could be identified in terms of online sensory communication and its evaluation. The experts confirmed that no sensory marketing model currently incorporates existing digitization trends and sensory aspects of communication. No model gives generic guidance on how to design an e-commerce website appropriately regarding sensory marketing and enables an efficient evaluation of the online sensory communication quality.

Chapter six focuses on evaluating the artifacts developed within the design science research approach (Hevner et al., 2004). This aligns with Hevner et al.´s (2004) the third DSR guideline that emphasizes the use of scientific methodologies to assess the quality, utility, and efficacy of a design artifact (see section 3.1).

This research effort has resulted in the creation of two artifacts for assessing sensory e-commerce content. Firstly, based on semi-structured interviews (SSI) and B2C-focused factor analysis, a novel index called OSMI was developed. This index, serving as the first artifact, is manually collected. Utilizing the OSMI, experts were tasked with independently conducting an analysis and subsequently completing the User Experience Questionnaire (UEQ) for this artifact. The analysis results from the experts are then compared, and the UEQ results are analyzed.

Accordingly, the second developed artifact, built upon the previous investigations from chapter V, was presented to experts in the domain of online marketing for testing and re-evaluation by applying the UEQ. Additionally, the evaluation of this artifact expands to include a second iteration of SSIs within the problem environment, confirming the initially proposed business need.

The outcomes of these research steps are critically applied to validate the appropriateness of the artifact and to address RQ7 through a statistical UEQ comparison. RQ7, as the final research question, seeks to determine whether a significant efficiency difference exists between the manual first artifact (I) and the automated approach of the second artifact (II).

6.1. EVALUATION OF MANUAL OSMI-ANALYSIS

In this section, the results of the OSMI´s manual application by the eight experts are presented and discussed. Following that, the evaluation of the OSMI as the first artifact is introduced based on the UEQ responses provided by IP1-IP8.

6.1.1. Results of Manual Expert Evaluation on Artifact I

The OSMI´s applicability was assessed in a field test involving 16 websites from four distinct industries aimed at investigating RQ5. This research question sought to determine the extent to which an industry-specific online sensory marketing assessment could be developed based on the knowledge base of design science (Hevner et al., 2004). By elaborating on this process, the face validity of the OSMI could be confirmed, demonstrating that the index and its assessment can be applied across industries and can effectively highlight the sensory characteristics and nuances of different companies and industries. However, since the previous investigation was conducted solely by the researcher, it is necessary to examine the degree to which results can be independently reproduced.

For this purpose, eight experts (IP1-UP8) were asked to spend approximately up to five minutes reviewing the Nespresso website as a preselected example of investigation and to navigate through its subpages to gain an understanding of the sensory content types used. Subsequently, the IPs were instructed on the OSMI measurement functionality and asked to input indicator scores into the OSMI assessment template. The results were then aggregated on parameter levels (Haptics, Gustation, Olfaction, Vision, Acoustics) as well as in both weighted and unweighted versions of the OSMI total score and compiled in Table 28.

To assess the reproducibility of the retrieved OSMI results, albeit with Nespresso as an example and without claiming representativeness, the following hypotheses (numbering in line with section 4.3.5) were tested based on evaluations:

- *H2a – Unweighted OSMI parameter evaluation should not differ by more than .20 in standard deviation (SD)*
- *H2b - On average, the expert´s OSMI and OSMIw should not differ by more than .10 (SD).*

Table 28. Results of Expert´s Manual OSMI Evaluation for Nespresso's Website

Individual Ratings	*Ø-Haptics*	*Ø-Olfactory*	*Ø- Gustatory*	*Ø- Acoustics*	*Ø-Visuality*	*OSMI*	*OSMIw*	*abs. Var.*	*rat. Var.*
Nespresso	*.27*	*.25*	*1.00*	*.00*	*.75*	*.45*		*.05*	*10.68%*
(Field Study)	*.03*	*.05*	*.19*	*.00*	*.23*		*.50*		
Expert 1	*.27*	*.50*	*.83*	*.00*	*.50*	*.42*		*.02*	*4.66%*
(IP1)	*.03*	*.09*	*.16*	*.00*	*.16*		*.44*		
Expert 2	*.47*	*.25*	*.83*	*.00*	*1.00*	*.51*		*.06*	*12.54%*
(IP2)	*.06*	*.05*	*.16*	*.00*	*.31*		*.57*		
Expert 3	*.27*	*.25*	*.83*	*.00*	*.88*	*.45*		*.06*	*14.58%*
(IP3)	*.03*	*.05*	*.16*	*.00*	*.27*		*.51*		
Expert 4	*.33*	*.25*	*.83*	*.00*	*.75*	*.43*		*.05*	*10.58%*
(IP4)	*.04*	*.05*	*.16*	*.00*	*.23*		*.48*		
Expert 5	*.20*	*.25*	*1.00*	*.38*	*.63*	*.49*		*.04*	*7.14%*
(IP5)	*.03*	*.05*	*.19*	*.07*	*.20*		*.53*		
Expert 6	*.20*	*.50*	*.67*	*.00*	*.88*	*.45*		*.07*	*15.36%*
(IP6)	*.03*	*.09*	*.13*	*.00*	*.27*		*.52*		
Expert 7	*.27*	*.00*	*.83*	*.00*	*.50*	*.32*		*.03*	*8.07%*
(IP7)	*.03*	*.00*	*.16*	*.00*	*.16*		*.35*		
Expert 8	*.20*	*.25*	*1.00*	*.00*	*.75*	*.44*		*.05*	*12.22%*
(IP8)	*.03*	*.05*	*.19*	*.00*	*.23*		*.49*		
Ø	*.16*	*.18*	*.53*	*.03*	*.50*	*.44*	*.48*	*.05*	*10.64%*
SD Experts	*.08*	*.15*	*.10*	*.12*	*.17*	*.05*	*.06*		

To compare the results of the manual expert evaluation applying the OSMI template, the results of the Nespresso evaluation from the previous field test analysis are also presented in Table 28. These can be considered reference values, indicating an OSMI of .45 and an adjusted OSMIw of .50.

Upon closer examination of the parameter assessments, it is noted that for the haptic sense, three out of eight evaluations share an identical value of .27. Only the IP2´s assessment significantly deviates with a value of .47 from the haptic mean of .28, and the standard deviation (SD) is moderate at .08.

Regarding the evaluation of the olfactory sense, a similar pattern emerges with an average score of .28 but with a nearly doubled SD of .15. This is driven by the fact that five out of eight experts rated the olfactory sensory appeal of the analyzed Nespresso website as .25. However, IP1 and IP6 both rated it as .50, while IP7 gave a score of .00, indicating the absolute absence of olfactory-related content.

The mean score for the gustatory sensory appeal, in contrast, is .53, with an SD of .10. Despite being a significant sense in the food industry (Krishna et al., 2014, 2016), only two out of eight participants awarded the highest score of 1.00 for this parameter, matching the a priori reference value from the field analysis. The other participants, except for IP6 (.67), awarded a score of .83.

Furthermore, the evaluation of the auditory sense is largely uniform, as it is practically nonexistent. This is a finding similar to the field study conducted previously. Only IP5 assigned a score of .38, while all other experts marked .00. However, IP5's evaluation slightly distorts the SD with a value of .12, which would have been .00 otherwise, and due to the small sample size, it has a larger impact.

For the fifth and final sense, equally significant in the e-commerce domain and the food industry in general (Karsten, 2010), the visual perception and its associated OSMI indicators were rated to have an average parameter score of .50. The SD value of .17 indicates the highest variability around the mean parameter score for visual indicators implemented on the investigated website. Individual results reflect this variability, ranging from the maximum (1.00 for IP2) to .50 (IP7).

In reference to the initially formulated hypotheses H2a and H2b, it must be concluded for a comprehensive assessment that the respective acceptable standard deviation thresholds are based on the fact that the OSMI remains a hypothetical index, and a certain degree of subjectivity in its evaluation cannot be ruled out. Misinterpretations by the observer are also plausible scenarios in evaluations. Following this note, both H2a and H2b can be confirmed. None of the analyzed SD values exceed the critical threshold of .20 for OSMI parameter assessments, thereby reinforcing H2a. In addition, the standardized deviations of the OSMI and the OSMIw are well below .10, supporting H2b. This further demonstrates the independent face validity of the sensory assessment methodology and indicates that divergent evaluations through mean and weighting considerations of sensory communication can be largely balanced.

6.1.2. Evaluation of Manual OSMI Artifact I (1. UEQ)

To further quantitatively assess the perceived user experience, in addition to the previously described evaluation of utility through the manual OSMI application (Artifact I), the UEQ (Laugwitz et al., 2008) was administered to the participants, and its results will be subsequently analyzed. Figure 38 illustrates the box plots representing the six dimensions of the UEQ concerning Artifact I. The positive (green) and negative (red) value ranges are visually indicated. For a positively rated user experience, ideally, the value range should lie, on average, at least one scale rating higher than zero in all dimensions (Range 1-3).

However, this UX survey's results depict a mixed image of the perceived user experience across various dimensions. The descriptive UEQ data is presented in Table 29. With respect to attractiveness, a neutral perception was noted, and similarly, the items of perspicuity were evaluated. Though, the latter dimension demonstrates the highest standard deviation (SD = 1.70) within the sample. The confidence interval of perspicuity incorporates both negative and positive values (-1.05 to 1.30), suggesting an inconsistent evaluation by the experts.

This may indicate that Artifact I could be overly complex or that the tabular data presentation appears somewhat rudimentary in this context.

Figure 38. UEQ Results of Artifact I (Manual OSMI)

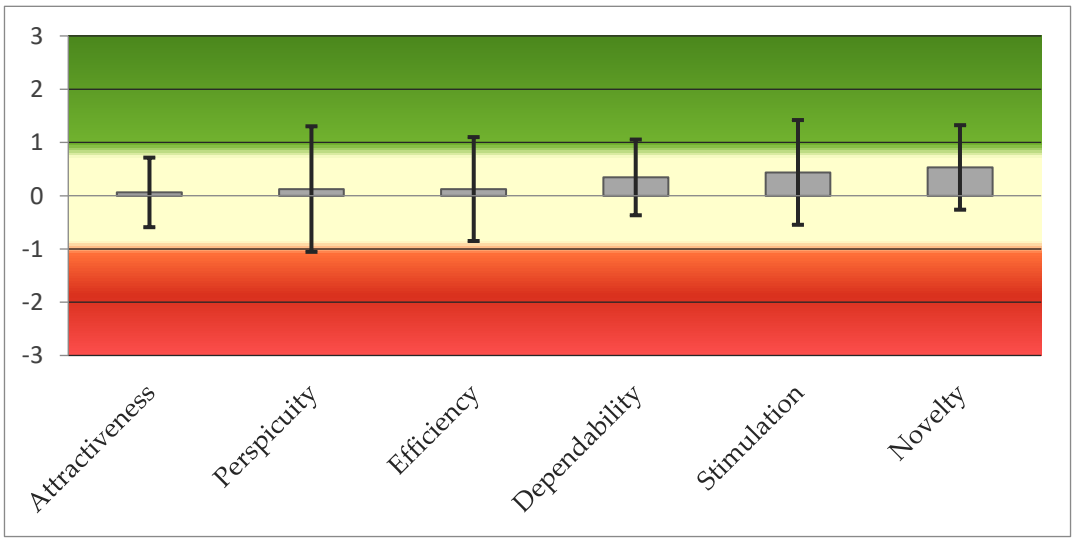


Table 29. Descriptive UEQ-Data Regarding Artifact I

Artifact I						
UEQ Dimension	***Mean***	***SD***	***N***	***Confidence***	***Confidence Interval***	
Attractiveness	*.06*	*.94*	*8*	*.65*	*-.59*	*.72*
Perspicuity	*.13*	*1.70*	*8*	*1.18*	*-1.05*	*1.30*
Efficiency	*.13*	*1.41*	*8*	*.98*	*-.85*	*1.10*
Dependability	*.34*	*1.03*	*8*	*.71*	*-.37*	*1.05*
Stimulation	*.44*	*1.42*	*8*	*.98*	*-.55*	*1.42*
Novelty	*.53*	*1.15*	*8*	*.79*	*-.26*	*1.32*

The efficiency dimension, as one of the core objectives of the artifact in the business context and its relevance for answering RQ7, is neutrally assessed (Mean = .13), with a moderate standard deviation (SD = 1.41). The confidence interval ranges from slightly negative to slightly positive values (-.85 to 1.10). This span indicates an average perception of efficiency. However, this observation falls short of the favorable range, hence a high level of efficiency in assessing online sensory marketing communication via the manual template, as presented in section 5.1.1.

While attractiveness, perspicuity, and efficiency were perceived neutrally, reliability, stimulation, and novelty tended to receive more positive evaluations. As shown in Table 29, the highest evaluations were obtained in the dimensions of dependability, stimulation, and novelty, whereas the lowest ratings on average were observed in the domains of attractiveness, efficiency, and perspicuity.

Nevertheless, the dimension of Novelty was attributed positive values (Mean = .53, SD = 1.15), and the confidence interval primarily displays positive values (-.26 to 1.32), underscoring the novelty of the artifact´s intent.

The aforementioned UEQ results of the manual OSMI assessment will be compared to those of the second UEQ analysis related to artifact II in section 0 of this dissertation. For this reason, it is aimed to illuminate if significant differences between the two artifacts among the six UEQ dimensions become apparent.

6.2. QUALITATIVE CONTENT ANALYSIS OF DSR EVALUATION INTERVIEWS

The following section outlines the procedure for conducting the evaluation of the derived OSMI Artifact II. Hence, as previously outlined, the results from the second SSIs following W.C. Adams' (2015) framework will be presented. The SSIs are transcribed in Appendix 19-Appendix 26.

In design science research, it is crucial to consider the involvement of experts throughout the entire research process, particularly in the development and evaluation of design artifacts (Hevner et al., 2004). Utilizing the same experts for a second interview offers several advantages. Since these experts are already familiar with the dissertation's research work and have participated in the initial interview, they can better understand the context and evolution of the artifact. They can provide valuable insights and feedback, having followed the entire DSR process. However, it is essential to ensure that the experts remain relevant and suitable for evaluating the artifact. Therefore, the second SSI guide (see Appendix 10) ends with self-assessment expert statements to verify that they possess the necessary domain knowledge and expertise to assess the artifact appropriately.

Subsequently, through a renewed application of qualitative content analysis (Mayring, 2000), an examination was conducted to identify whether new categories emerged that were not present in the first round of interviews for identifying a business need within the DSR process. Hence, the categories that emerged inductively form the basis for the DSR evaluation phase. This was accomplished by ascertaining whether the developed artifact meets the expert´s expectations and fulfills the business need. The gathered feedback derived from the second SSI phase is analyzed and grouped. Conclusions are drawn while summarizing potential enhancements and improvements in the following separated categories.

6.2.1. Usability/Design

IQ1: How do you assess the practicality of the mock-up in terms of its usefulness in a real/business setting?

The initial interview question pertains to the usability and design of the prototype developed in section 5.3 for the visualization of potential automated evaluation of sensory-based e-commerce content. The term "prototype" was used

interchangeably with "mock-up" and "application" in the interviews. It is essential to note that this inquiry primarily aimed to elicit qualitative feedback concerning the prototype, reflecting well-implemented usability criteria while also seeking potential avenues for improvement and suggestions from experts who, according to their statements, are already familiar with other e-commerce analytical tools in their daily business setting.

In response to IQ1, all interview participants unanimously affirmed that the prototype´s usability aligned with expectations in a professional manner derived from the problem environment and its business need, thereby providing insights into the tool's appropriateness within the context of the DSR evaluation phase. Subsequently, positive feedback and constructive criticism to enhance usability will be comprehensively examined.

From a broader perspective, the experts evaluated the usability as beneficial and easy to use. In this regard, IP5's response to the presented IQ5 question is as follows: "*Absolutely. So, when I saw that, I was very pleasantly surprised because I could have imagined it just like that. "*(IP5, 01:22). Similarly, IP4 confirms this sentiment using comparable phrasing, emphasizing both the dashboard and the individual aspects presented, along with how they are presented. Additionally, IP8 highlights a particularly positive aspect of usability, noting that: *„It's very understandable because you use a graphic and icons and then go from the rough to the details"* (IP8, 05:22).

Furthermore, IP6 confirmed that the OSMI assessment prototype fundamentally adheres to the established usability standards commonly recognized and accepted as the norm for other tools. IP1, IP5, and IP7 are also familiar with the design software Figma, which was utilized in creating the prototype (as outlined in section 5.3), and they incorporate it into their website and content design in their daily business operations. While IP6 is acquainted with the tool, he has not personally utilized it thus far. Additionally, IP6, IP7, and IP8 underscored the importance of icons in enhancing tool comprehension, noting that icons are more effective in aiding understanding than relying solely on textual elements. IP7 elaborated on the fact that individuals learn functionalities differently and remarked about his way of learning to be familiar with new tools, that visualizing is one of the essential aspects that developers should keep in mind to address every kind of potential user. This is also the underlying reason for the

potential natural variability observed in both qualitative and, particularly, quantitative usability assessments (Laugwitz et al., 2008). This variability arises due to the diverse experiences, attitudes, and other criteria individual human subjects hold. Nonetheless, a distinct trend in UX evaluations should remain perceptible. In connection with this, IP2 confirmed the prototype's fitting usability, yet she also highlighted that: "*It took me a few minutes to understand what it means now and where what information is shown. But then it's also very intuitive. That you can fold out content, even if you've clicked through it yourself […]* (IP2, 01:49). Similar expressions were voiced by IP3, who stated: *"I had to find my way around and see how it works on my Mac. But then, of course, I quickly understood that on the left is the navigation, if you can click through like that"* (IP3; 00:13). However, closely related to this, IP3 conveyed: *"I got used to it relatively quickly and I find that certain elements are also in the places that you're used to from other tools, from other website testing tools or similar. So, because of that, I found it relatively easy to use."* (IP3, 01:09).

Besides the positive evaluations and comments provided by the experts thus far, they also addressed critiques. IP6 and IP8 highlighted that the usability would need significant adaptation for various devices, including the landing page layout and the content amount. However, it's worth noting that this falls beyond the purview of this dissertation, which initially assumes a predominantly desktop-oriented user base. Nevertheless, it can be handled as a pertinent consideration and should be included in future work regarding the OSMI assessment to ensure its comprehensive cross-device applicability.

Concerning usability, the experts (including IP1) identified minor issues during testing, mainly related to hover functions. These hover functions need to be consistently clear, as, for instance, the underlying animations associated with the sensory icons did not immediately convey the outcome of clicking on them or the destination of the user's navigation within the tool and its subpages. To resolve this matter, a hover function might be incorporated, offering a concise explanation of the significance and meaning of the linkage before any interaction takes place.

Additional recommendations regarding usability have also been provided in various aspects. IP1, primarily engaged in creating Amazon content for brand stores, has suggested that, apart from the primary language, English, the finalized version of the OSMI Assessment tool should include other languages as well. He

proposed an option to have additional areas of analysis, considering that the tool currently focuses on an e-commerce website operated by the company itself (Nespresso in the presented example) but does not assess distributor pages such as Amazon, including brand stores, for instance. Consequently, the usability could be more satisfactory for his business-related needs. However, this presents a clear expansion opportunity for sensory analysis and should be incorporated into the artifact´s future versions. Although, the sensory content utilized is frequently identical regardless of whether it is implemented within the company's e-commerce system or an Amazon brand store. Moreover, IP4 proposed the incorporation of more sliders, particularly on the Dashboard, to enhance readability and interactivity, leading to *"gain a more distinct perspective and concentrate better on individual points than is currently possible"* (IP4, 02:59).

6.2.2. Information Quality

IQ2: How do you evaluate the satisfaction of your expectations regarding the specific information about sensory marketing quality displayed by the app?

All experts responded uniformly to IQ2, expressing that they are generally satisfied with the informational content given in the OSMI assessment tool. Nevertheless, there were nuances in the degree of satisfaction itself, along with suggestions for improvement within this specific criterion, which will be elaborated upon below.

In essence, all IPs equally evaluated the utility of the detailed analyses, supported by concrete content examples, as high. IP1 described: *"And I think that's by far the most exciting thing about it, that you actually get the suggestion directly here, without having to think about how you can ultimately make it better. So, I would say that the information content quality is definitely high enough."*(IP1, 10:12). IP2 also shared this perspective and highlighted: "*Because that was still such a bonus level for me. That it's not just saying that the multisensory communication is not pronounced enough, but that you know exactly what you can do. And then each company could interpret that for itself."* (IP2, 03:29). As a result, she emphasized that with the dashboard´s informational content and the recommendations provided, content optimization is feasible concerning sensory consumer engagement. Hence, optimization would

encourage consumers to better, or even initially, engage in sensory imagination of the product attributes (see section 1.3.3).

IP7 likewise validated the recommendations' usefulness and articulated his preference for comprehensively detailed instances of successful sensory communication initiatives. He noted that he learns best from examples that are as detailed as possible, as he can abstract from them and apply the knowledge to his field of professional work. Thus, visual aids, notably images, play an essential role in accelerating comprehension compared to textual guidelines. In addition, IP7 contended that this image specificity enhances the tool's appeal to individuals without specialized knowledge and stressed that: "*If you have a guideline, you can at least orient yourself to it and perhaps you don't have to be an absolute expert in the subject of sensory communication"* (IP7, 05:13). Furthermore, there are numerous marketing professionals who regularly have to deal with a multitude of figures in their daily business activities. In this context, IP7 underscored the time-consuming nature of acquiring an overview, and, regarding the artifact, he noted: *That's why I think the downscaling to the most important metrics in the tool is very successful.* (IP7, 02:50).

Similarly, IP3 observed that the informational level already reflects what she would expect from a tool on the sensory subject in the e-commerce domain. In light of the abundance of information, IP3 argued, "*I think they're all useful at first. And you also address different target groups, different people. And maybe one person doesn't really go into depth and is more superficially interested, but I would offer all the information."* (IP3, 04:09).

In contrast, IP4 expressed a desire (partly due to his background) – he also contributed to creating the item pool (see section 4.5.1) – for more extensive and profound insights into sensory marketing within the tool. Currently, he rated the informational content as satisfactory but believed that there is still room for improvement. IP6, however, when asked about the depth of information, indicated that he would not include too much content at the beginning and favored a strategy of continuous improvement within the live version.

Moreover, IP8 appreciated the value of presenting a comprehensive summary of the company´s sensory results, completing detailed information about all five senses (in %), and the specific recommendations tailored to the website.

However, IP1 pointed out that not all OSMI indicators are listed within the recommendation segments. As these are currently only examples of indicators, the decision was made to refrain from inundating the assessment mock-up with excessive information to prevent information overload and ensure clarity of purpose. In a real implementation of the tool, all indicators would need to be included. Additionally, IP1 noted that he was perplexed that the recommendations are organized by content type, whereas the indicators were previously presented in detail for each sense. It is worth noting that the recommendations pop-ups establish a connection across the senses, aiming for a compact representation. Since there were no similar feedback points, the structure will remain unchanged.

Concerning potential issues with the informational content, a common point of concern among the experts arose regarding the bar graphs within the sensory details of the OSMI indicators and their evaluations. For instance, IP1 provided an illustrative account: *„I wondered what the bars next to them were for. Until I realized, of course, that is grayed out."* (IP1, 14:14). IP8 initially did not grasp the significance of the bar graphs, too, indicating that an improvement in the visualization is needed.

IP2 described her initial lack of understanding regarding the potential value of the sub-page "History" feature. Since this feature is meant to offer potential benefits, as indicated by other experts in the initial round of interviews concerning tool requirements, she noted that this particular aspect might be less relevant to her in an initial go-live phase. Despite this, she summed up her overall perspective on the informational content, stating that: "*Despite this [historical sub-page], I think everything is really well structured, understandable and logical."* (IP2, 09:43).

Furthermore, IP4 suggested that the company data on the dashboard and benchmarking is more of a "nice-to-have" rather than an essential requirement. However, it could offer interesting supplementary information for certain users.

Responding to IQ2 yielded numerous additional recommendations regarding the informational content and its further enhancement. The experts originate from the DSR environment and are partially familiar with other assessment tools, so they provided several insights. Initially, IP3 suggested a differentiation between OSMI analysis recommendations to "this could be optimized," and "this needs to be optimized." While this is an important aspect, it must be noted that a prioritization assignment of the made sensory optimization recommendations based on the

analysis is already included through a point system within the recommendation pop-up sub-pages (see section 5.3.1.2). It must be acknowledged, however, that this is not expressed clearly enough in the current artifact and needs improvement.

Additionally, she suggested specifying and breaking down the priorities for individual OSMI indicators, as the sensory pop-ups currently only indicate priority based on content type for the specific industry, without detailing potential differences between indicators A and B in sensory communication, such as textual content. Alongside IP3, other experts from the sample (IP4, IP6) proposed an additional priority list that can be worked through within the tool and exported. IP3 summarized the underlying idea as follows: "*That you have a list that includes what you have to tackle first and which aspects do not have such a high priority but could still be optimized"* (IP3, 09:55). This aligns with the reality of limited time and human resource capacities within firms, as highlighted by IP4 and his statement: "*As a company, you also have to look at what to do first."(*IP4, 07:21). In this regard, IP2 and IP6 noted that the user of the tool still maintains a certain level of decision-making autonomy related to the presented content and how and when to implement recommendations from any tool.

Other aspects for further optimizing the artifact´s informational content and quality were mentioned by IP7, among others, by inserting so-called best-in-class examples of websites of the same or, if applicable, even of other industries. These examples could serve as references to guide creative agencies or colleagues in developing similar sensory marketing assets for their own websites. IP7 also recommended identifying the top aspects relevant to creating sensory content for non-experts, such as image resolution, lighting, recording equipment (camera, audio), and similar factors, to avoid insufficient quality or uninteresting design. As an add-on, he envisioned the possibility of directly linking external partners within the tool's specific recommendations. These partners could assist in content creation, offering an additional layer of value from his perspective.

From a more holistic perspective, an important consideration emerged regarding the outcomes of using the artifact. It was noted that more justification of added value should be included in the finalized application of the OSMI assessment artifact and its recommendations. For instance, demonstrating that an enhancement in sensory consumer appeal related to taste for a specific website

leads to an improved conversion rate of x percent. IP2 expanded on this with the following conclusion: *"By that, I mean that the increase of the OSMI is not the only goal, but connected with that, the conversion could also be improved. I would find that even more convincing, but I also find it very good now."* (IP2, 05:31). Likewise, she stressed that these experiential insights can only be generated once the tool is utilized in business settings and real data, such as improvements in sales metrics, becomes available.

A similar line of reasoning was reflected in the observations made by IP6. He noted an interest in understanding the functioning of the tool (as well as IP8), specifically how the tool conducts its analyses, the underlying basis, and the methods employed. Consequently, even though it is broadly outlined under the "Concepts" section, it could be more prominently explained that the tool involves an AI-based assessment of the sensory communication quality. Similarly, IP6 wished for more insights into the objectives of improving individual indicators, aiming to better comprehend the overarching purpose. By this, he essentially referred to a justification based on individual OSMI indicators, which is not trivial, given that consumers have varied needs regarding sensory content. Nevertheless, a potential compromise could be to provide an overall figure derived from the success values obtained through applying OSMI recommendations that illustrate the tool's impact on common e-commerce metrics like conversion or bounce rates.

In conclusion, IP4 and IP6 also recommended directly explaining the sales approach and customer value on the landing page, similar to other established assessment tools. IP6 suggested illustrating these concepts vividly with figures as soon as they become available. Ideally, incorporating customer cases dealing with success using well-known companies' examples would further reinforce the impact by providing more prominent information for users without prior knowledge.

IP5 shared a similar perspective, incorporating information, especially for non-experts, regarding sensory communication more prominently outside the blog post section. For instance, he proposed that explanatory videos could be employed for this purpose. This sentiment was echoed by both IP2 and IP8, with IP8 emphasizing that her understanding became clearer as she delved into the analysis details and observed the website´s sensory-specific outcomes.

6.2.3. Comparability

IQ3: How do you assess the satisfaction of your expectations and business needs in terms of the industry-comparability function displayed by the app?

The following criterion that emerged inductively through the DSR problem revealing phase for the individuals in the environment is the ability to compare sensory assessment results with relevant competitors. This comparability feature has been incorporated into the tool through benchmarking (see section 5.3.1.3), and qualitative feedback on this aspect was gathered using IQ3. As expected, some of the input from IQ3 has already been addressed in the context of IQ2 concerning informational content. Nonetheless, specific aspects of the benchmarking will be elaborated upon below, expressing again satisfaction, constructive criticism, and recommendations from those involved.

IP1 indicated that he had not identified any negative aspects concerning comparability, and he found the sub-page comprehensible right from the outset. IP1 emphasized that the tabular presentation of the OSMI analysis results on the benchmarking sub-page was his most crucial element. He underscored it as follows: *"I think the table with the overview and the individual values makes the most sense. Namely, to understand how the haptic sense is addressed in my case compared to [competitors]"* (IP1, 20:16).

IP2, IP6, and IP8 further elaborated that the benchmarking met their expectations, and they found it particularly useful that not only the overall OSMI score is provided but also that it is further expanded with the parameter values for the five senses. This enhancement allowed them to discern, for instance, where competitors might outperform the investigated e-commerce website or lag behind in terms of a specific sense. Accordingly, IP2 concluded: *"I think it's good, that rounds it off again to see a little bit why I should get better at sensory communication in e-commerce."* (IP2, 10:33). IP3 shared a similar perspective with IP2 and observed that the sub-page is *"kept simple, but it expresses what it's supposed to say"* (IP3, 05:38).

However, IP1 recommended adding a feature where users can manually select the desired comparisons with other competitors, as this is preselected in the prototype. On the other hand, IP3 noted that she did not miss this feature, as she would initially work with the overarching scores and, if needed, utilize the URL

input function to conduct the same dashboard analysis for another company of interest. These varying comments highlight a significant point: even though the participants are all assigned to a business setting, they are not only professionally homogeneous (as it was intended, see section 4.2.1.4) but also diverse regarding individual preferences. Consequently, the challenge in tool development is to account for this diversity. It should be noted that the finalized artifact is intended to have an embedded function, but it was not feasible to represent it differently during mock-up creation. Thus, it makes sense to integrate such a function as an optional element without presuming its mandatory use. Instead, this should allow interested users to comfortably utilize such additional functionalities.

Regarding the values, IP1 and IP8 pointed out a discrepancy between the benchmarking representation (in decimal numbers) and the dashboard for individual results (presented in %), which should be aligned in the tool to enhance comparability. While this aspect requires adjustment, it does not impact the interpretation of the OSMI benchmarking analysis results. This is because the OSMI is a 1-based index, meaning it can only have values between zero and one, which theoretically correspond to the range of 0 % to 100 %.

Moreover, 6 out of 8 participants (excluding IP3 and IP4) raised criticism related to the information presentation in the benchmarking sub-page, specifically about the information quality of the integrated word-cloud chart, suggesting that it would be better to omit this element. It is noteworthy that this was already integrated as an add-on without having the highest informational priority within the comparability function. Therefore, it was placed at the lower end of the sub-page. However, the unanimous critique suggested that redesigning presenting frequently used keywords and their informational essence might be necessary.

Despite this, IP4 asserted that, apart from the partial fulfillment of its expectations, the given information on the dashboard was considered satisfactory. He proposed supplementing the benchmarking information with statistical data concerning the utilization of sensory contents, as depicted within the dashboard. Additionally, IP4 recommended including a comparative evaluation of how competitors execute similar strategies and an assessment of their performance across distinct OSMI indicators. Similarly, IP5 shared the same perspective and endorsed the incorporation of specific examples within the benchmarking. This

approach aims to provide immediate and efficient means of identifying and comprehending areas for sensory enhancement. Summarizing concisely, IP6 articulated: *„I would recommend including indications and actionable recommendations for benchmarking, similar to what's done with the dashboard."* (IP6, 20:40).

In summary, it can be concluded that the Benchmarking sub-page has deliberately been presented in a highly aggregated manner so far, yet it has generally managed to meet the expectations of the experts. Moving forward, the comparability feature will be expanded to include dashboard functionalities, aiming to provide increased convenience.

6.2.4. General Statements

IQ4: Are there any other aspects not mentioned so far that you believe are essential for a useful OSM evaluation framework?

IQ4 aimed to determine whether the experts can identify any additional aspects not previously mentioned but deemed important after considering the preceding questions of three categories. As anticipated, the IQ4 was answered concisely by the participants, leading to elaborate specifically on aspects that have not emerged from the previous questions. This section closes with the sub-questions of IQ4 pertaining to the aspects of "most liked" and "most disliked" prototype elements, which are also briefly presented.

One direction evident in the responses to IQ4 deals with the functional expansion of the prototype itself. For instance, IP3 expressed high satisfaction with the tool but emphasized that certain usability and information-related aspects can likely only be assessed after the go-live phase. Thus, she deemed it a favorable start if the tool were launched with the current functional and informational status.

Furthermore, in a similar functional context, IP4 suggested that: "*You might also work with links or examples […] [and] I would suggest that you somehow also show where exactly this could be found and changed on the website or on which pages there is still nothing sensory."* (IP4, 11:36). Particularly, he justified his proposal by drawing from his prior professional experience, noting that companies typically implement numerous sub-pages with varying content, fitting different products. Through a more targeted analysis, one could discern which pages have received lower ratings.

Displaying these pages explicitly would enable direct editing, facilitating the optimization of sensory communication in accordance with the recommendations. IP4's statement pertains to the representation of these linkages within the tool itself.

In this context, IP2 further elaborated on the integration of a function that allows the tool user to manually select which sub-pages to analyze. Since only the base URL is required for analysis, this option could be valuable, particularly when examining content for a specific new product line.

On the other hand, IP1 and IP5 noted that, under certain circumstances, a real-time plug-in extension could be offered optionally that enables one to analyze a website and simultaneously provide sensory suggestions directly on the website. Although not explicitly mentioned, such a feature could also be integrated into a company's website development tool as an add-on for sensory styling in the future.

Another criterion on the functional level of the artifact was identified by IP5, involving the potential tracking of sensory content adjustments made based on an OSMI analysis, as follows: *"Assuming an e-commerce website applies the OSMI tool, then, of course, you could work with a popup, with the question to the visitor, "How do you find this, and this presented?". So that consumers are really asked while browsing. Or then, post-purchase, they are asked why they decided to buy on that website and whether sensory marketing, for example, influenced that."* (IP5, 11:27). It is noteworthy, that IP5´s notion is an important part of the future work aimed at substantiating and justifying the OSMI's impact beyond the initial indicators through further investigations.

From a content perspective, IP8 proposed that in addition to the assessment, the OSMI indicators could be placed in another section within the tool and explained in slightly more detail. Currently, the design includes presenting each indicator and rating the individual contents of the examined webpage, but not separately in a higher level of detail. This aligns with the previous suggestions for additional background information, which could be implemented under the concept's category.

What aspect stood out to you the most?

In reference to the sub-question of IQ4 regarding the identification of an aspect that interview participants found particularly positive, consensus points to both the dashboard and, more significantly, the recommendations located in it for

optimizing sensory aspects of their own e-commerce content. IP1 succinctly summarized this sentiment as follows: *"From my point of view, the most interesting thing is this detailed overview, where I also get a suggestion for what you could write, what kind of picture you could show, etc. In fact, images are also displayed in that case."* (IP1, 25:32), He additionally acknowledged the potential source of inspiration for his own content creation with a sensory-stimulating focus. IP5 also underscored the utility of the dashboard as *"information accessible shortly and concisely. I find it super clear"* (IP5, 13:23). IP6 shares this perspective.

IP7 commended the overall structure of the prototype and the dashboard. He appreciated that on this sub-page, he could immediately grasp the current state of his website's sensory communication quality through the ratings and understood the specifics behind it.

What aspect did you dislike and why?

Specific cross-category feedback was solicited to further enhance the OSMI assessment artifact as well. In this context, IP2 suggested that the "history" sub-page could be further improved, particularly regarding data explanations. In addition, IP6 point out to incorporate actionable recommendations on the benchmarking sub-page, as he found their absence there. Nonetheless, Given IP6's appreciation for information condensation, which he often recommends in his role as a strategic advisor, he also envisioned the integration of the dashboard and benchmarking sub-pages. This merger would involve condensing information by incorporating a traffic light system next to each indicator. Furthermore, the benchmarking results would be presented in detail, highlighting OSMI indicators that are better (green), comparable (yellow), or even worse (red) than those of relevant competitors.

Finally, the concept of weighting was highlighted by IP1 and IP4 as a detail that could be communicated more explicitly. Simultaneously, their background knowledge makes them particularly critical in this aspect (see section 4.2.1.4). IP2 also noted that a finalized version should indicate when a sensory overload has been reached. This scenario must certainly be addressed in the live version but has been somewhat overlooked for the sake of simplicity. Feasibly, this could be achieved by warning signals and/or distinct color markings within the content categories to indicate if excessive sensory elements in communication exists.

6.2.5. Expected Business Impact

IQ5: How do you assess the potential impact of applying this software to your daily business? Please rate in % according potential sales uplift.

To assess the potential sales uplift resulting from the utilization of the artifact, IQ5 was employed and presented to the participants. As guidance, a rough range of 0-15% for content optimizations and the associated financial impact was estimated based on a recent e-commerce benchmarking report (Contentsquare, 2023) and provided if it emerged during the conversation or the experts couldn't anticipate value ranges ad hoc. The underlying intention was primarily to ascertain whether participants, in cases where they did not initially provide a value range, would align with this example, and anticipate significantly less, or perhaps even more substantial business effects resulting from the implementation.

IP1 spontaneously mentioned a 7% potential sales increase, which is partially reflected by rising conversion rates, and he substantiated his expectation with insights gained from his specialization in Amazon Brand Store design, stating that: *„We also have an overview of what sales were ultimately made via the brand store, how many more clicks you have, and ultimately, it's always within a 5% to 6% range. But that's not bad, of course, because if you consider what large companies ultimately sell and what 5% more means for such figures, then it's not negligible or to be talked down."* (IP1, 27:42).

IP2 compared the potential impact with similarweb or Google Analytics and estimated the potential sales uplift to be up to 10%. However, she emphasized that gauging a sales impact depends on the baseline of sensory communication quality from which optimization begins. This statement aligns with the findings from both the manual and automated OSMI analyses in Chapter V. It becomes evident that global players like Apple (the world's most valuable firm) already achieve a high OSMI rating, likely due to their available marketing budget, as (sensory) content creation, can be cost-intensive.

Analogously, IP3 envisioned that the sales uplift could potentially fall within the illustrative range of 0-15% and pointed out that: "*So, decisions are made subconsciously, and if you follow these recommendations and optimize your website this way, I believe this could affect sales and increase it."* (IP3, 13:52).

On the other hand, prior to being provided with the illustrative reference range, IP4 had already contemplated a potential uplift ranging from 10-20%. He also highlighted, much like IP2, that: *"It depends on whether you start from a rather chaotic and unorganized page, a page that is not optimized, to a page that is already perfectly sensory optimized."* (IP4, 16:46).

In contrast, IP5 estimated as follows: *"I would probably go to 5 to 10% maximum. I'll say I don't know if you can subconsciously influence that much just by writing down or picturing sensorily."* (IP5, 14:53).

IP6 spontaneously opted for a value midway within the given range, estimating around a 7-8% sales uplift through tool utilization. Additionally, he supposed that this is a substantial figure, representing a noteworthy potential for sensory-driven optimizations.

In response to IQ5, IP7 provided the following answer: "*Okay, so I think the OSMI index's issue is not primarily traffic, as in SEO optimization, for example. But rather, it's tangential to the user experience and, therefore, the conversion rate.* (IP7, 18:33). However, in a realistic sense, he still considered 20-30% to be plausible, thereby assuming the highest value range throughout the expert sample.

Lastly, IP8 suggested a value of 10% and explained her assumption by stressing that the tool alone will not be able to boost sales because there remains a need for companies to manage the creation and implementation of sensory content.

IQ6: Do you consider any other financial impact of sensory-enhancing content software?

The final interview question aimed to engage the panel of experts in a discussion about positive financial side effects that could potentially arise from applying the artifact, which may not be immediately evident in the form of sales uplift. The dissertation´s author initiated the discussion by suggesting a reduction in return rates and an efficiency increase in the marketing department.

As a result, all participants considered such enhanced efficiency and simultaneous reduction in returns plausible. IP5, in particular, shared this view based on his role as a content creator in the textile e-commerce sector. He confirmed that discrepancies between online product presentation and perceived product

quality often lead to unmet expectations, potentially resulting in a lower return rate when designing online content according to the OSMI recommendations. IP8 concurred strongly, given her similar professional background, emphasizing the need for more vivid content.

During the discussion, there were further indications of potential influences that the utilization of a sensory marketing assessment tool could introduce in the e-commerce domain. According to the experts, these positive effects could arise by declining negative word-of-mouth communication, unfavorable opinions derived from unmet expectations (IP1), and improved brand connection (IP4).

Additionally, beyond IP4, IP6 and IP7 identified an increase in retention rate, e-commerce store revisits, and similar key performance indicators as potentially beneficial factors. IP7 also mentioned the possibility of reducing bounce rates by engaging sensory content and argued as follows: "*So let's assume that the customer liked the virtual shopping experience so much that it really lengthens the page duration or the session duration in general because the willingness to simply browse increases, which is something you can somehow observe very often in the offline sector, but all the more rarely online. You're back on the X so quickly and have left the page.*" (IP7, 21:10).

6.2.6. Summary of derived Artifact Recommendations

In addition to the intended goal of evaluating Artifact II, it was also aimed at gathering valuable recommendations from the experts that can subsequently be applied post-dissertation to transition the OSMI AI assessment concept into a comprehensive real-time application.

Accordingly, Table 31 presents a summary of the obtained recommendations, which concurrently serve as the cessation criterion for the design artifact in this dissertation (Hevner et al., 2004), as previously outlined in section 3.1 (DSR guideline seven). Ultimately, the aim of this work is to develop a new concept for assessing sensory elements in e-commerce both manually and automatically, resulting in a mock-up for a new application. The completion of the fully functioning application falls outside the scope of this work; however, the preceding work and the subsequent recommendations provide the basis for the forthcoming software development stages in the domain of AI assisted sensory assessment tools.

Table 30. Derived Recommendations on Artifact II

Domain	*Recommendation*
Usability	*Responsive Web-Design across devices*
	Adding additional Languages
	Adapt to specific requirements of distributor pages (e.g., Amazon)
	Include Sliders for a comprehensive UX experience
Information quality	*Implement additional hover interactions with content that explains particular meanings, figures*
	Include more sensory marketing insights, including tips for appropriate sensory e-commerce content creation and weighting
	Enhance the sub-page "history" with additional information on how to use and interpret the presented content
	Add an OSMI recommendations priority list, distinguishing between "this could be optimized" and "this needs to be optimized"
	Add Best-in-Class examples
	Add justification throughout the Artifact utilizing presenting financial benefits etc., as soon as these figures are validated
	Add "how-it-works"-section (AI Assessment)
Comparability	*Enable manual selection of competitors*
	Add the same detail level of individual OSMI indicators as presented on the dashboard´s sub-page
	Supplement the benchmarking with statistical data (amount of content by type)
	Update given content and explain its meaning better to meet user expectations (e.g., word-cloud-chart)
General	*Integrate functionality to reveal the location within the e-commerce website of the analyzed sensory content*
	Development of Plug-In-Extension
	Tracking options related to changed sensory content

6.2.7. Final Estimation of Expert Self-Rating

To conclude the SSIs, the experts were asked to rate both the OSMI Artifact II and their final assessment of their own expertise in the broad scientific field of this dissertation using German grading scales. Table 31 illustrates that the ratings for both statements fall within the range classified as "very good" to "satisfactory." Consequently, IP1-IP8 collectively rated the artifact overall within the range of 1-2 and their final expertise assessment within the range of good to satisfactory.

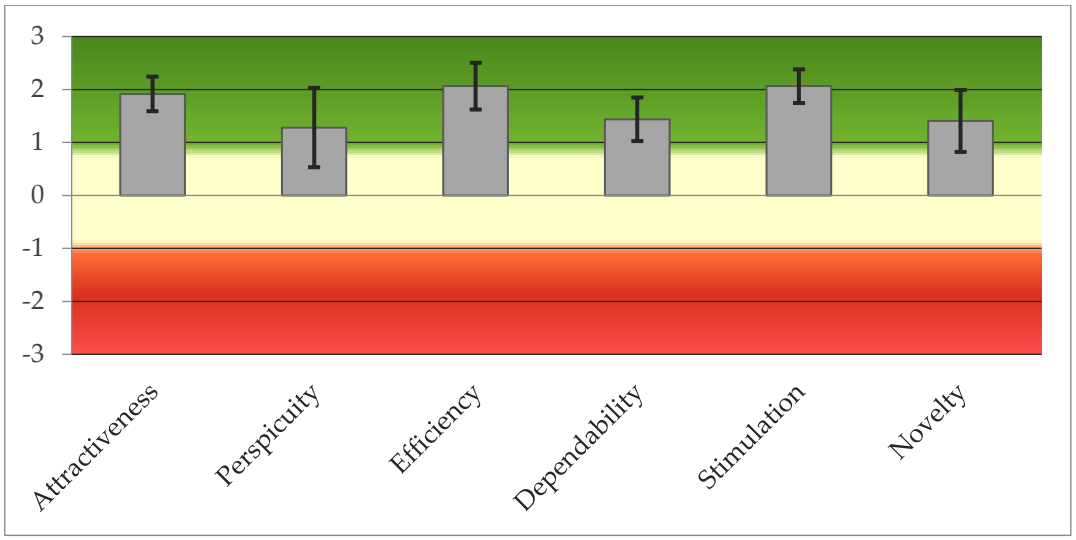
Table 31. Expert´s Self-Assessment Related to DSR Problem Environment

Expertise Statement	*Very good*	*Good*	*Satis-factory*	*Suffi-cient*	*Poor*	*Insu-fficient*
Rating	*1*	*2*	*3*	*4*	*5*	*6*
Artifact II	*IP2, IP3, IP5, IP7, IP8*	*IP1, IP4, IP6*				
*Dissertation topic**		*IP1, IP2, IP4, IP8*	*IP3, IP5, IP6, IP7*			
***Note: Experts are remained as such if they rate themselves better than sufficient*						

6.3. OSMI PROTOTYPE EVALUATION (2. UEQ)

Enhancing the previous qualitative evaluation of the OSMI Artifact II via SSIs, a quantitative analysis was complemented by conducting another UEQ evaluation with IP1-IP8. The results are presented analogously to the manual OSMI UEQ (section 6.1.2), applying box plots in Figure 39 along with dimension means, standard deviation, confidence, and intervals depicted in Table 32. The acquired data reveal that, across dimensions, the box plots prominently extend into the positive range. Likewise, the confidence intervals exhibit a comparable pattern, with no UEQ dimension tangent to a negative region (red). Firstly, the prototype's attractiveness received an above-average positive rating of 1.92 and a low SD of .47.

Figure 39. UEQ Results of Artifact II (Mock-Up)



Secondly, perspicuity received the lowest average score in the sample, with a mean of 1.28. The comparatively high standard deviation (SD = 1.08) indicates a broader variation in responses. The confidence interval (.53 to 2.03) reveals that, to some extent, variability in opinions about perspicuity exists.

In contrast, efficiency was rated at 2.06 on average. This implies an overall satisfying perception, supported by the slight variance (SD = .64) in given answers. Hence, IP1-IP8 rate the potential efficiency enhancement within a business setting quite positively, which will later become relevant for the final assessment of RQ7.

The user experience in terms of stimulation, novelty, and dependability also yielded positive outcomes across the board. Stimulation was similarly assessed to efficiency. Suggesting in line with the earlier qualitative interview responses within the SSIs, all interviewees evaluated Artifact II both useful and appealing. which are significant attributes for future utilization within marketing managers´ daily work.

The novelty effect (mean = 1.41) and dependability (mean = 1.44), on the other hand, received relatively moderate but still positive ratings in the sample. Standard deviations and confidence intervals in these dimensions point to relatively consistent opinions, aligning with the responses in Section 6.2.

As a consequence, it can be observed that the UEQ demonstrates an above-average positive perception of the user experience across the defined dimensions.

Table 32. Descriptive UEQ-Data Regarding Artifact II

Artifact II						
UEQ Dimension	***Mean***	***SD***	***N***	***Confidence***	***Confidence Interval***	
Attractiveness	*1.92*	*.47*	*8*	*.33*	*1.59*	*2.24*
Perspicuity	*1.28*	*1.08*	*8*	*.75*	*.53*	*2.03*
Efficiency	*2.06*	*.64*	*8*	*.44*	*1.62*	*2.50*
Dependability	*1.44*	*.59*	*8*	*.41*	*1.03*	*1.85*
Stimulation	*2.06*	*.46*	*8*	*.32*	*1.75*	*2.38*
Novelty	*1.41*	*.84*	*8*	*.59*	*.82*	*1.99*

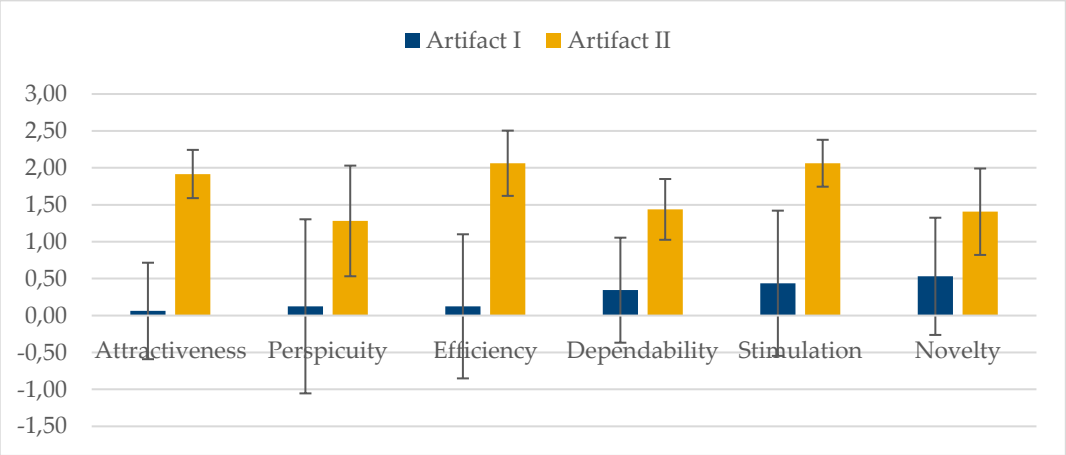
In summary, attraction, efficiency, dependability, and stimulation received particularly positive evaluations. Perspicuity and novelty are also predominantly perceived positively, albeit with some variation in given responses, consistent with given qualitatively feedback in the SSIs. These findings suggest that the artifact exhibits favorable quality criteria that will next be compared to the manual OSMI.

6.4. COMPARISON OF OSMI MANUAL ANALYSIS APPROACH AND PROTOTYPE

Having already quantitatively assessed both approaches, the manual and the automated OSMI artifacts, separately by experts IP1-IP8, it becomes now necessary to examine the statistical differences between these two approaches. The aim of the subsequent comparison is to address RQ7, which seeks to answer to what extent the automated OSMI application concept outperforms the manual OSMI analysis framework in terms of its potential to increase work efficiency in business settings. Concurrently, within the framework of the design science research process, this constitutes an essential component of the evaluation phase, ensuring the final quality of the constructed artifacts in terms of suitability for problem-solving within the previously identified environment (Hevner et al., 2004).

In the preceding sections 6.1.2 and 6.3, preparation was made by delving into the descriptive statistics of the two UEQ analyses. These are visualized and compared in Figure 40, highlighting Artifact I in dark blue and Artifact II in yellow.

Figure 40. Comparison of Manual Analysis Approach (I) and Prototype (II)



Upon direct comparison, a noticeable significance between the two sensory assessment approaches emerges. The box plots of Artifact II are positioned within notably higher and consequently more positive value ranges compared to those of the manual approach. In the same vein, the confidence intervals for the latter are notably broader and extend into slightly negative value ranges for each UEQ scale.

However, the detached visual examination of the differences between the two artifacts will be subjected to significance testing utilizing test statistics (Hair et al., 2013). For this purpose, the data distribution of the sample must be assessed. The UEQ data are ordinally distributed by nature, and the responses obtained from the experts do not suggest a normal distribution. In addition, tests for normal distribution, such as the Kolmogorov-Smirnov and Shapiro-Wilk test, can be effectively applied only with larger sample sizes (Yap & Sim, 2011). An attempt to apply the both aforementioned tests to the available dataset yielded inconsistent outcomes. For instance, efficiency was determined to exhibit a nonparametric distribution, while novelty displayed a normally distributed pattern. Based on these premises, the decision was made to opt for a non-parametric test, specifically the Wilcoxon-Mann-Whitney test (also known as the U-Test), instead of a t-test. The U-test does not rely on distributional assumptions and is robust when dealing with data measured on an ordinal scale (Mann & Whitney, 1947). Consequently, the U-Test is applied in this dissertation to test whether two independent data sets originate from the same population (MacFarland & Yates, 2016). Based on this, the

hypotheses (H3) is tested at a significance level of $p < .05$, which is defined below:

H3: Artifact II significantly outperforms Artifact in terms of the efficiency rating.

Table 33 reveals the results from two sample U-test for each UEQ dimension. The findings of the gathered data via user experience questionnaire (Laugwitz et al., 2008) indicate significant differences between the two artifact development stages in terms of attractiveness, efficiency, dependability, and stimulation. The p-values for these dimensions are .001, .003, .03, and .005, respectively, all below the cut-off alpha level of .05. These figures suggest that there are statistically significant variations, supported via moderate and strong effect sizes (Cohen, 1988), between the two sensory assessment approaches in terms of perceived user experience. On the other hand, there were no significant differences found in terms of perspicuity and novelty, with p-values of .24 and .15, respectively.

Importantly, the results of the efficiency dimension confirmed the greater usefulness of the second tool (OSMI Prototype) compared to the first one (manual OSMI Analysis). These outcomes highlight the advantage of the second design in its ability to shape perceived efficiency, which can have practical implications for improving workflow and decision-making processes in designing attracting online sensory marketing communication. Lastly, given the below depicted significant figures of efficiency differences confirms H3. With the hypothesis being accepted, RQ7 can be answered as well, confirming an efficiency increase through Artifact II.

Table 33. U-Test between UEQ-Attributes from Artifact I & II

UEQ Dimension	*U-Value*	*P-Value*	*Cohen's d*	*Significance (α = .05)*
Attractiveness	*0*	*.001*	*.83*	*Significant Difference*
Perspicuity	*20.5*	*.24*	*.29*	*No Significant Difference*
Efficiency	*3.5*	*.003*	*.74*	*Significant Difference*
Dependability	*11.5*	*.03*	*.53*	*Significant Difference*
Stimulation	*5.5*	*.005*	*.69*	*Significant Difference*
Novelty	*18*	*.15*	*.36*	*No Significant Difference*

6.5. DISCUSSION

This chapter concludes the DSR development process within the scope of this dissertation. Building upon the previously conducted implementation phase, the critical evaluation of the two developed artifacts through the rigorous application of scientific methods was addressed (Hevner et al., 2004).

Initially, the manual OSMI Artifact I was applied by the experts IP1-IP8 and subsequently quantitatively assessed through applying the UEQ analysis to efficiently assess its user experience (Rauschenberger et al., 2013). Notably, it was determined that the application of the manual OSMI works independently of individuals and meets face validity by simultaneously accepting small variations in sensory indicator assessment among the experts. However, the UEQ results suggested that the template tends to yield neutral outcomes, indicating that it is, as expected, not yet sufficiently attractive, comprehensible, and efficient.

As an intended secondary solution and the main goal of this dissertation, the artifact in which the OSMI AI assessments were previously tested, and experts qualitatively and quantitatively evaluated the results visualized in a mock-up to obtain a transparent understanding of its acceptance in the DSR environment.

Hence, another round of SSIs was conducted and supplemented with the UEQ assessment for Artifact II. The interview results clearly indicate that the finalized Artifact II aligns with the expectations that the target audience generally holds regarding usability, information quality, and comparability. However, a series of recommendations have emerged. The UEQ comparison for statistical significance additionally underscored the preceding qualitative feedback. It revealed that the UEQ dimensions were answered more satisfactorily across the board, with mean scores in the favorable range. Nevertheless, not all dimensions of the user experience were significantly improved; for instance, perspicuity, a finding analogous to the SSI answers, disclose the need for further enhancements regarding the tools' simplicity as it is not yet sufficiently pronounced for laymen.

In conclusion, RQ7 could be confirmed, highlighting the artifact's efficiency enhancement potential. As suggested by IP1-IP8, on average, a business impact of approximately 7-10% (or even higher) could be achieved. This underscores the artifact's capacity to adequately address the identified DSR environmental need.

VII – CONCLUSION AND OUTLOOK

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The findings obtained are discussed in this dissertation's seventh and final chapter. A conclusion is derived based on the results obtained. At the end of this chapter, the limitations and perspectives for future research in the field of sensory e-commerce design are further outlined.

7.1. DISCUSSION

"Designing rich sensory experiences is an important aspect for consumer encounters in both digital (online) and physical (offline) contexts."(Labrecque, 2020, p. 1013).

As additionally stated by Labrecque (2020), digital experiences currently still lack the ability to replicate the sensations of touch, smell or taste. Regardless, there is an ongoing shift in the consumer journey from offline to online (Statista, 2023b). The world is becoming incrementally more digital each day, and the shift of consumer behavior towards digital domains, coupled with the capability of making purchases from anywhere at any time, has become a prevailing norm.

Hence, businesses find themselves consistently compelled to provide an e-commerce user experience aligned with the desires and requisites of consumers. This encompasses user experience (UX) elements, such as site navigation and interactivity, and the digital content contained therein, including textual, visual, video, and audio elements, and interactive content (e.g., 3D visualizations). Beyond serving a purely informative purpose, these elements also serve as sensory triggers, warranting deliberate targeting (Petit et al., 2019).

The question that emerges in this context is how to efficiently determine, from the provider's perspective, the effectiveness and sophistication of sensory communication within an e-commerce presence utilizing these types of content. Moreover, it is interesting to identify potential areas of optimization for online sensory marketing (OSM) based on the current status quo. This is the present dissertation's focus, drawing upon existing assessment methodologies from various disciplines and/or thematic focuses, proposing a novel assessment

approach – a scoring system termed the Online Sensory Marketing Index (OSMI). This index aims to provide a comprehensive view of OSM efforts on a B2B level for an e-commerce website. To achieve this, the OSMI draws on insights from scientific literature and incorporates indicators related to digital sensory marketing, which have been identified by other sources as relevant to the scope of OSM and, thus, to this work. Numerous sources now address the transition from offline-centric sensory marketing to its manifestation in the digital environment (Petit et al., 2015).

Several studies have already demonstrated that, for instance, the purchase intentions on e-commerce websites can be extended through a multisensory approach to consumer engagement, such as sensorially enhancing texts or images (Doucé et al., 2022), or even integrating interactive 3D product views (Kang et al., 2020). As a consequence, the overall content quality of an e-commerce website is elevated through such multisensory content optimization. Other studies also reveal that, in addition to willingness to pay, a multisensory approach to consumer engagement can positively influence purchase intent and even product attitude. However, it is important to note that the current body of research primarily draws upon insights from the offline domain. Most studies have been conducted in the context of offline retail situations. Yet, it is assumed that these findings also apply to the online domain, given the shared underlying effects across these studies. This assumption stems from how individuals perceive their environment from a psychological perspective, as sensory information is generally processed unconsciously, often receiving less emphasis or conscious recognition from consumers. Thus, this dissertation underscores that the primary focus lies in the multisensory orchestration of e-commerce websites, achieved through subliminal consumer stimulation. Accordingly, the core underlying elements of sensory marketing are those delineated in section 1.3 and briefly stated below:

Multisensory Enhancement is the construct that involves the combination of various distinctly engaged sensory impressions (e.g., audiovisual sensory stimulus combinations) to create a perceptual experience that is more intense and, thus, more precise than what one would expect from each sensory impression.

Need for Touch describes the human desire for tactile stimulation and touch to achieve emotional well-being and sensory satisfaction. The NFT characteristics are not uniformly pronounced in all human beings.

Sensory Imagination serves as the fundamental human capacity for this dissertation. It portrays the ability to imagine vivid and complex multisensory experiences in which different senses, such as sight, hearing, and touch, are linked in mental images that can be recalled anew when consciously evoked.

Sensory Overload occurs when sensory impressions become overwhelming due to an excessive quantity or intensity of stimuli, leading to processing difficulties. An effect that has not been extensively explored in the online domain.

Sensory Deprivation is the precise opposite manifestation of an overload effect.

Built upon these psychologically grounded effects, the manual OSMI assessment framework also explored whether achieving the same results is feasible by utilizing AI and Big Data methods. The objective was to develop a concept that would be more efficient and preferable when compared to manual evaluation methods within the context of the design-science-research framework. In this relation, via a systematic literature analysis, this work revealed that the current research focus – the combination of Online Sensory Marketing and AI for content assessments - arose as an emerging field of study, and is now directly addressed within the marketing discipline (Institute Marketing Science, 2022).

7.2. CONCLUSION

As illuminated at the outset of this work, sensory marketing is a crucial economic driver for companies in contemporary times, both offline and online. Optimizing the consumer journey in a sensory style can yield significant advantages for consumers, leading to improved short-term imaginative awareness of the advertised product and its attributes (e.g., fabric quality, size, weight, etc.), as well as ultimately contributing to medium- to long-term improvements in customer satisfaction. These effects have been substantiated by studies conducted within the academic context.

From the companies' perspective, OSM deployment can similarly offer advantages. This includes an evident, directly monetarily discernible positive effect, wherein digital key performance indicators such as dwell time, reduction in bounce rate, increased or higher cart value, and ultimately, the overarching conversion rate improve. Less conspicuous yet equally significant is the potential

enhancement of efficiency within marketing departments. If an assessment framework and optimization potentials related to OSM were in place, marketing managers could systematically evaluate and sensorially optimize the e-commerce presence. Ultimately, the aforementioned positive aspects of a successfully implemented OSM necessitate a dual presence of requisite knowledge and human resources within marketing departments to execute necessary sensory content adjustments. These possible B2B constraints lead to the focus of this dissertation, which has raised the overarching research question:

ORQ: *Does a need for sensory marketing efforts in online environments exist, and to what extent can automated assessments based on AI help increase efficiency in online marketing department´s daily work?*

Addressing the ORQ required operationalizing into subdivided research questions (RQ1-RQ7). To achieve this, a total of eight stages were delineated.

The initial step encompassed, after illustrating the significance of sensory marketing and its underlying concepts from a scholarly perspective, conducting semi-structured expert interviews following the methodology of W.C. Adams (2015). Given that this work pertains to a business-oriented and practical inquiry (ORQ), the elaboration of individual work steps was tailored to Hevner's DSR guidelines (2004). Accordingly, the first step involved identifying a potential business environment and confirming its need for sensory evaluation of e-commerce deemed beneficial. The DSR framework advocates the use of qualitative research methods for this purpose. Thus, the choice was made to engage in one-on-one interviews followed by qualitative content analysis following the Mayring approach. As previously mentioned, from a B2B perspective, the driving force behind sensory designs is the marketing department and their employees. For this reason, marketing managers were selected, as they possess a substantial overlap in their scope of digital marketing activities and are operationally and tactically responsible for designing, commissioning, and implementing sensory content.

The results of the semi-structured interviews (SSIs) from the environmental phase have made two significant contributions to this work. On the one hand, the interviewed experts unanimously confirmed the business need for sensory

evaluation and optimization of e-commerce websites, thereby defining the scope of the dissertation and initiating the subsequent DSR work steps. On the other hand, qualitative inquiries were made regarding the experts' personal online search behaviors. The responses to these questions, alongside other criteria, informed the development of the OSMI assessment framework and its corresponding indicators.

The second step was dedicated to covering the rightmost external pillar of the DSR framework (see Figure 3), involving exploring and establishing a comprehensive knowledge base. This knowledge base encompassed research areas of sensory marketing, assessment frameworks in related domains, and potential intersections with AI and big data. The goal encompassed all the necessary knowledge elements to answer the ORQ comprehensively. For this purpose, a unique approach was adopted, involving a combined scientific literature review using the AI-based STIRL methodology alongside manual expansion. Initially, AI assistance was employed to ensure the discovery and grouping of a maximum number of scientifically relevant articles within the research scope. Building upon this, a manual systematic literature review (SLR) was conducted. The outcome demonstrated the existence of an open research question, as neither significant existing concepts for sensory evaluation of e-commerce content nor approaches to combine AI with sensory marketing (and its measurement) were found. The SLR supported to underpin the connection to the confirmed business need scientifically.

The subsequent step aimed to further enrich the knowledge base with a contemporary B2C perspective on sensory e-commerce content. Potential content-related indicators were initially identified based on the SSIs and the SLR to achieve this. These were translated into a questionnaire and thereafter transformed into an online survey in a revised format. This survey was then subjected to Exploratory Factor Analysis (EFA), and the resulting four-factor solution was confirmed through a second survey employing Confirmatory Factor Analysis (CFA). The outcomes of the CFA were incorporated into the subsequent implementation phase, thus directly contributing to the development of the assessment framework.

The fourth step was dedicated to developing the OSMI as Artifact I. Building upon all the insights gathered thus far, a new index was formulated to serve the purpose of this work. The OSMI addresses the requirements for both industry-specific weighting with combined easy usability and interpretation. To confirm its

functionality and face validity, a field study involving 16 websites from four industries was conducted. This study affirmed the index's applicability and its depth of interpretation, including the identification of optimization potentials.

As the manual approach of OSMI might not fully meet the efficiency demands of the business environment, a significant aspect of the ORQ in the fifth step was to investigate the extent to which AI-based OSMI assessments are feasible. To achieve this, structured investigations were conducted based on content types to determine whether automated retrieval, analysis, and conversion into an OSMI score were possible. The results indicated that evaluating individual OSMI indicators and, ultimately, an overarching OSMI score for the entire e-commerce website is achievable. However, given the resources available in this work, this process came with restrictions. Initially, text elements from 116 target websites were retrieved through a customized crawling process and preprocessed using NLP methods. Subsequently, the usage of sensory keywords was transformed into OSMI-like scores through TF-IDF calculations and Min-Max scaling, and the results were evaluated. Images constitute the most frequently used sensory elements in the digital sales environment. Consequently, a specialized retrieval and analysis process was employed for this content type. The image analysis was expanded to various OSMI attributes, including (Product) Object Detection, Face and Emotion Recognition, and Text in Images Classification. The results of these analytical steps were henceforth added to the metadata.

Additionally, the remaining three content types—Audio, Video, and Interactive Elements—were investigated within the context of the OSMI indicators. Due to time constraints and limited computational resources, a sampling approach was adopted. This examination demonstrated the general feasibility of extracting spoken advertising text from audio files, extracting images and audio from video files and evaluating the implementation of interactive elements such as 3D visualizations using automated HTML code.

Yet, the automated OSMI assessment approach was initially tested by a consolidated analysis of the seven OSMI indicators derived from text and image analysis. The objective was to demonstrate the feasibility of transitioning to an automatic sensory measurement proposal and to showcase that despite not fully covering all OSMI indicators at this stage, interpretable and logical evaluation

results can be achieved. A comparison of these results with the field study revealed certain analogies concerning sensory communication nuances across different industries. This outcome indicates the promising potential of this approach, underscoring the need for its further expansion.

The DSR Implementation phase and the artifact design cycle were finalized by the sixth step, which involved the creation of a clickable software prototype, Artifact II, in the form of a mock-up. This mock-up serves the purpose of visualizing and conducting a final problem-solving assessment of the business environment. It was developed based on the requirements gathered from the SSIs and presents OSMI results in a dashboard format that includes actionable recommendations, benchmarking features, and additional informative elements.

According to the DSR framework by Hevner et al. (2004), an artifact should be evaluated by the target audience to assess its potential for addressing the initially identified business needs. Thus, in the eighth and final step of this work, the OSMI prototype (Artifact II) was evaluated to ascertain its potential for enhancing efficiency in marketing departments. The same experts who had previously confirmed the business environment were engaged for this evaluation, facilitating the best suitable before-and-after comparison approach. The evaluation encompassed three sub-aspects through a mixed-methods process (Tashakkori & Teddlie, 1998). Initially, Artifact I was tested for its practicability. For this purpose, the experts evaluated an identical website using the manual OSMI and subsequently answered a validated User Experience Questionnaire (UEQ). The results indicated, on the one hand, that the application of the manual OSMI template generates user-independent valid results and supports the previous findings of the field study. However, the UEQ results of the template were generally moderate based on the six user dimensions (as discussed in section 4.1.5).

Subsequently, Artifact II, which embodies this work's primarily targeted business solution, was qualitatively evaluated employing SSIs conducted again. The usability, information content, and comparability categories obtained previously were used as evaluation criteria, and a business impact was discussed, too. The business environment, specifically the marketing managers, unanimously confirmed that the developed Artifact II significantly contributes to addressing the business need for evaluating sensory communication on e-commerce websites if it

were to be available in the market. A business impact assessment was likewise carried out, that indicated a potential high single-digit percentage increase in sales uplift, along with other potential effects such as increased marketing department´s efficiency and reduced returns due to better-prepared sensory content.

For the final evaluation of the ORQ, it was necessary to demonstrate an improvement in efficiency. For this purpose, a UEQ evaluation was also performed by the experts for Artifact II, and these results were subsequently quantitatively checked for statistical differences compared to Artifact I. The analysis revealed that, among other UEQ dimensions, efficiency is perceived significantly more positively. Alongside the qualitative feedback from the SSIs, this supports the practicality of the automated OSMI assessment approach.

In particular, by aligning the dissertation research effort along the DSR framework, a unique artifact was created to address a business need identified as relevant in the environment. For this purpose, the dissertation needed to follow a rigorous and, thus, scientifically sound working method in every process phase. The work, strictly aligned with the DSR guidelines, demonstrates, based on the aforementioned steps, an efficiency-enhancing assessment tool for e-commerce sensory measurement. Therefore, the ORQ can be considered as fully achieved.

7.3. LIMITATIONS AND FUTURE WORK

"Web site quality measurement is neither simple nor straightforward." (Aladwani & Palvia, 2002, p. 476). As underlined by the quote, evaluating website quality, regardless of its content focus, is a complex task. Thus, this work addressed whether there is a need to evaluate and optimize digital sensory communication quality, and how such measurement could be carried out. Certain sources (see section related indices – 4.4.3) have previously addressed similar questions and developed assessment approaches for specific offline and online-related indices.

The OSMI framework developed in this work based on design science in information systems research relies on three scientific pillars to identify indicators for successful sensory communication in e-commerce. Firstly, an extensive SLR was conducted, incorporating substantial scholarly insights. These were supplemented by a qualitative round of SSIs with marketing experts who shared their subjective

opinions on sensory e-commerce content. A third pillar was introduced through an EFA and CFA to ensure robustness. This analysis focused on a B2C perspective regarding the significance of individual sensory content aspects. Contrary to the initial assumption, the statistical investigation yielded a content-oriented 4-factor model. However, considering the goal was to assess the general importance from the consumer's perspective, the sensory structure was retained in the conception of the OSMI. This was done based on industry-specific sensory weighting, in line with the WQI and practicality considerations, even though the WQI omitted this step.

While the application of the OSMI can be deemed valid through both a field study and extended testing by experts, the OSMI itself is not without limitations. The OSMI remains a hypothetical index, regardless of how it is presented or calculated (manually/automated). Moreover, developing the weighting of OSMI parameters and indicators is not a straightforward task, as these weightings and assessments inherently possess a degree of subjectivity. This subjectivity is also present in the study by Fernández et al. (2014), even though a group of experts evaluated the WQI. Personal preferences or prioritizations and their influence on assessments cannot be entirely eliminated. Additionally, it can be assumed that some companies have already incorporated the basics of sensory communication. Thus, not all companies start from the same point regarding sensory content optimization. While the OSMI enables comparisons between companies and industries, each company and marketing manager must draw their own conclusions based on derived assessments. This situation is analogous to other assessment frameworks (e.g., similarweb) and indices referenced 4.4.3.

A promising avenue for future research using the OSMI assessment framework could involve examining whether additional indicators should be included in the future. Conceptually, this is feasible since the result always involves an average consideration, making the number of indicators somewhat secondary. Moreover, an alternative weighting approach, such as prioritizing by content and then by industry, could also be a research direction. However, practicality, mainly focused on the efficiency enhancement aimed for in this work, should remain a primary concern. Therefore, any future assessment should also ensure that the evaluation process doesn't become overly complex. Likewise, another research path could emerge by comparing OSMI results with outcome variables such as

conversion rate, dwell time, etc. However, as explained earlier, this would require extensive investigations due to the potential moderating influential (industry, company size, brand awareness, and others).

The termination criterion of the DSR framework is met, yet not necessarily at its conclusion, illustrating the DSR framework´s iterative nature. On the contrary, as demonstrated by the machine-based sensory analysis in section 5.2, further steps are required to establish a Big-Data infrastructure capable of fulfilling diverse requirements and enabling a feasible AI-based OSMI calculation. Simultaneously, the scope of this dissertation aligns with the most current research trend, as the recent surge in combining (sensory) marketing with AI research has gained momentum and will be a strong focus moving forward (Cascio Rizzo et al., 2023).

Within the scope of the resources available for this dissertation, the status quo of AI-based sensory assessments has been generally successful. Texts and images could be automatically retrieved, processed, and transformed into an OSMI value. However, due to their rarity, other elements, such as audio and video elements, require substantial computational power to acquire and process the data according to the evaluation principles of OSMI. It must be noted here that certain websites prevent crawling altogether. In such assessment cases, automated sensory analysis is technically unfeasible and, particularly from a legal standpoint, not desired by the company. In these rare instances, an Artifact I study is preferable.

Drawing insights from both manual and automated analyses, in conjunction with the requirements generated from SSIs, the prototype, Artifact II, has been developed and conceptualized as an interactive mock-up. However, further steps are necessary to provide it with a comprehensive software setup, which in turn is built upon the integrated Big-Data Infrastructure. Nonetheless, the created prototype already offers tangible design suggestions and informative perspectives aligned with the potential DSR environmental user base.

Sensory marketing will continue gaining prominence as businesses seek to differentiate themselves from competitors. While companies might not be able to alter the product itself, they can undoubtedly modify how it is presented and perceived digitally. In summary, the model introduced presents an entirely new framework for optimizing content related to multisensory customer engagement on e-commerce websites and potentially additional digital consumer touchpoints.

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APPENDIXES

APPENDIXES

Appendix 1. Semi-Structured Expert Interview Guide I (DSR Problem Scope)

Domain	*IQ*	*Interview Question (IQ)*
Introduction	*IQ1*	*How long have you been working in this department?*
	IQ2	*What are your daily responsibilities?*
Online Sensory Marketing	*IQ3*	*How do you proceed when you shop online? (Search behavior, click behavior on the platform)*
	IQ4	*Do you think consumers can experience comparable sensory experiences in the online buying process?* *(compared to offline)*
	IQ5	*Which sensory components in online shopping do you pay particular attention to?*
	IQ6	*How important do you consider sensory content to be in the individual purchasing process (offline and online)?*
	IQ7	*Do you think that there is a need to evaluate the sensory communication quality of your website?* *o If yes, how important is this area and do you also compare the e-commerce websites of your competitors with regard to the sensory content?* *o If not, are there any reasons for this?*
Formal Criteria for the Evaluation Framework	*IQ8*	*In your opinion, what factors contribute to the practical usability of a designed framework?*
	IQ9	*What specific information would you expect the framework to present regarding online sensory marketing assessments?*
	IQ10	*How do you rate the importance of competitor information?*

Appendix 2. Interview Consent Form

Consent for Interview

Research project: Online Sensory Marketing Evaluation (PhD project)

Institution: Universidad Católica San Antonio de Murcia (UCAM), Spain

Interviewer: Kevin Hamacher M.Sc.

Supervision: Prof. Dr. Rüdiger Buchkremer/ Prof. Dr. Laura Campoy

Interview date: xx.xx.xxxx

1. I have agreed to take part in an interview as part of the aforementioned research project. The interviewer has informed me about the aim and the course of the research project.

2. I agreed that the interview was recorded and put into written form. The recording files will be deleted after defense of the thesis, but no later than 31.12.2024. The transcripts of the interviews will be stored anonymously, i.e. without indication of the name and personal data. The scientific evaluation of the interview text will be carried out by the interviewer in accordance with the provisions of the General Data Protection Regulation (DSGVO) and all other data protection regulations.

3. My participation and my consent to the use of the data as described above are voluntary. I have the possibility to revoke my consent at any time. I will not suffer any disadvantages as a result of refusal or revocation. I also have the right to information, correction, blocking and deletion, restriction of processing, objection to further processing and data portability of my personal data.

4. Under these conditions I have agreed to give the interview and was and agree that it was recorded and written down as well as evaluated.

Name and Surname in Block Letters

Date, Place, Signature

Appendix 3. Item Set for B2C Perspective

Initial Item Set for B2C Perspective. Items deleted during refinement processes are marked in blue. The numbers in parentheses in the first column of the table below assign the remaining items to the respective factor of the 4-factor solution according to the CFA (see section 4.5.3).

No.	*Item*	*Item Description*
H1 (1)	*Text-based haptic imagery*	*Haptic keywords enhance my imagination of touching an online presented product (e.g., "soft")*
H2 (2)	*Text-based haptic imagery*	*Narrative descriptions enhance my imagination of touching an online presented product (e.g., "The smartphone convinces with a design that fits perfectly in the hand")*
H3 (1)	*Text-based haptic imagery*	*Direct speech within texts enhances my imagination of touching an online presented product (e.g., "Let your fingers glide through the handle and feel the pleasant warmth of your coffee through the dense glass of the cup.")*
H4	*Endowment effect / ownership imagery*	*Haptic-styled texts enhance my imagination of owning an online presented product (e.g., "Personalize your product and make it yours with next-gen tools and accessories.")*
H5	*Endowment effect / ownership imagery*	*Emotional images enhance my imagination of owning an online presented product*
H6	*Endowment effect / ownership imagery*	*I-Perspective pictures enhance my imagination of owning an online presented product*
H7 (3)	*2D-Images*	*Super zoom images of products enhance my imagination of owning an online presented product*
H8 (4)	*2D-Images*	*Pictures presenting products from different angles support me in imagining touching an online presented product*
H9 (3)	*2D-Images*	*Pictures with an I-perspective on a website support me in imagining touching an online presented product*

No.	*Item*	*Item Description*
H10 (4)	*Images showing the dimensions of the product*	*Images showing the dimensions (e.g., the size in mm) of the product help imagine the size an online presented product*
H11 (3)	*3D product visualization*	*Automatic 3D product visualization enhances my haptic imagination of touching an online presented product*
H12 (4)	*3D product visualization*	*Interactive 3D product visualization enhances my haptic imagination of touching an online presented product*
H13 (3)	*Product video (moving images)*	*A product video enhances my haptic imagination of touching an online presented product*
H14 (4)	*Product video (moving images)*	*A product video including a spokespersons explanation enhances my haptic imagination of touching an online presented product*
H15 (4)	*Virtual try-on (VTO)*	*An Integrated augmented reality app that enables self-location (e.g., placing furniture virtually in a room), enhances my haptic imagination of touching an online presented product*
H16 (3)	*Virtual try-on (VTO)*	*An Integrated augmented reality app that enables personalization (e.g., changing a product´s virtual color) enhances my haptic imagination of touching an online presented product*
H17	*Representation of interpersonal touches*	*Images showing a socially warm setting (e.g., peoples interacting with each other by touch) enhances my haptic imagination of touching an online presented product*
H18	*Brand*	*A brand that I know contributes to decreasing my desire to touch an online presented product before purchase*
H19	*Online forum*	*An integrated online forum contributes to decreasing my desire to touch an online presented product before purchase*
H20	*Positive mood*	*A bad mood conveyed by the website decreases my desire to touch an online presented product before purchase*

No.	*Item*	*Item Description*
H21	*Positive mood*	*Enthusiastic mood pictures of persons/animals decrease my desire to touch an online presented product*
H22	*Positive mood*	*Enthusiastic mood-picture-text-combinations conveyed by the website decrease my desire to touch an online presented product*
H23	*Recommendation agents*	*If a recommendation agent is implemented on a website, my desire to touch an online presented product decreases*
H24	*Interactive Chat with employees*	*If a chatbot function is implemented on a website, my desire to touch an online presented product decreases*
H25	*Interactive Chat with employees*	*If a chat function with real employees is implemented on a website, my desire to touch an online presented product decreases*
H26	*Discounts (price promotion)*	*If the website offers a price premium (discount), my desire to touch an online presented product decreases*
O1 (1)	*Text-based olfactory imagery*	*Olfactory keywords on website enhance my imagination of smelling a product's attributes (e.g., "fresh, wooden, fragrant")*
O2 (2)	*Text-based olfactory imagery*	*Narrative descriptions on a website enhance my imagination of smelling a product's odor attributes (e.g., "a classic fragrance blend of tart woody notes for a natural daytime and evening perfume.")*
O3 (1)	*Text-based olfactory imagery*	*Direct speech within texts on a website enhances my imagination of smelling a product's odor attributes (e.g., Can you imagine the smell of a freshly brewed coffee in the morning?")*
O4 (2)	*Imaged-based olfactory imagery*	*Mood images on a website evoke imagining smelling a product's odor attributes (e.g., a nature scenery)*
A1 (1)	*Text-based acoustic imagery*	*Acoustic keywords on a website enhance my imagination of hearing a product's acoustical attributes (e.g., "melody; tune; sound")*

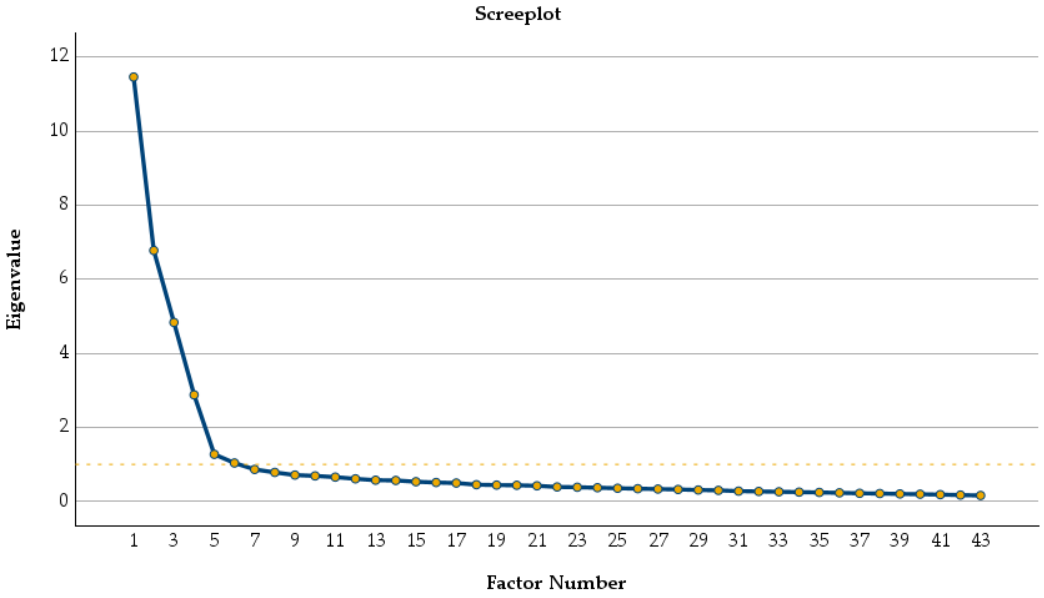
No.	*Item*	*Item Description*
A2 (2)	*Text-based acoustic imagery*	*Narrative acoustic descriptions on a website enhance my imagination of hearing a product's acoustical attributes "e.g., "the sound of the music system is unique and will reverberate the room")*
A3 (1)	*Text-based acoustic imagery*	*Direct acoustic speech within texts on a website enhances my imagination of hearing a product's acoustical attributes (e.g., "Enjoy movies, music, and virtual meetings with amazing detail, richness, and depth thanks to Dolby Atmos® sound.")*
A4 (2)	*Imaged-based acoustic imagery*	*Mood images on a website evoke imagining hearing a product's acoustical attributes (e.g., a picture showing a noisy or quiet atmosphere)*
A5	*Sounds / Music*	*Simple tones on e-commerce website that match a product's acoustical attributes support the virtual product experience (e.g., the motor sound of a sports car)*
A6 (2)	*Sounds / Music*	*Music on a website that matches the sensory product attributes supports the virtual product experience (e.g., soft music to soft products)*
A7	*Sound s / Music*	*I prefer to activate the tones/music manually on a website per click*
A8	*Perceived sounds about lived words*	*Words that are sensually adapted to the product being presented on a website enhance my auditory experience (e.g., "crunchy" for chips)*
A9	*Speaker / Voice*	*A voice integrated on a website sensorially explaining the product attributes enhances my auditory experience*
A10 (2)	*Speaker / Voice*	*A voice that spreads a positive mood enhances my auditory experience*
G1 (1)	*Text-based gustatory imagery*	*Flavorful keywords on a website enhance my imagination of tasting a product's attributes (e.g., "delicious; sweet; fruity")*

No.	*Item*	*Item Description*
G2 (2)	*Text-based gustatory imagery*	*Narrative descriptions of on a website enhance my imagination of tasting a product's flavor attributes (e.g., "The sweet taste of caramel softens the roasted notes of the product.")*
G3 (1)	*Text-based gustatory imagery*	*Direct speech within texts on a website enhances my imagination of tasting a product's flavor attributes (e.g., "Make every coffee moment an unforgettable experience!")*
G4 (2)	*Imaged-based gustatory imagery*	*Mood images on a website evoke imagining tasting a product's flavor attributes*
G5 (1)	*Use of color schemes*	*The use of color schemes contributes to the taste perception of a product advertised online (e.g., green for healthy food)*
G6 (2)	*Adjustment / design of brand/product name*	*The design of the brand and product name has an impact on taste associations of an online presented product*
G7	*Typography of the product description*	*The caption used on an e-commerce website has an impact on taste associations of an online presented product*
G8	*Product look (incl. packaging) and surfaces*	*The product layout presented online has an impact on taste associations of an online presented product*
V1 (1)	*Text-based visual imagery*	*Visual keywords on a website enhance my imagination of seeing a product's attributes (e.g., "recognize; imagine; look; watch)*
V2 (2)	*Text-based visual imagery*	*Narrative descriptions on a website enhance my imagination of seeing a product's attributes (e.g., "With its chrome accents, it will certainly fit any kitchen")*
V3 (1)	*Text-based visual imagery*	*Direct speech within texts on a website enhances my imagination of seeing a product's attributes (e.g., "Close your eyes. Think "jeans". Now open. They were 501 s®, right?")*

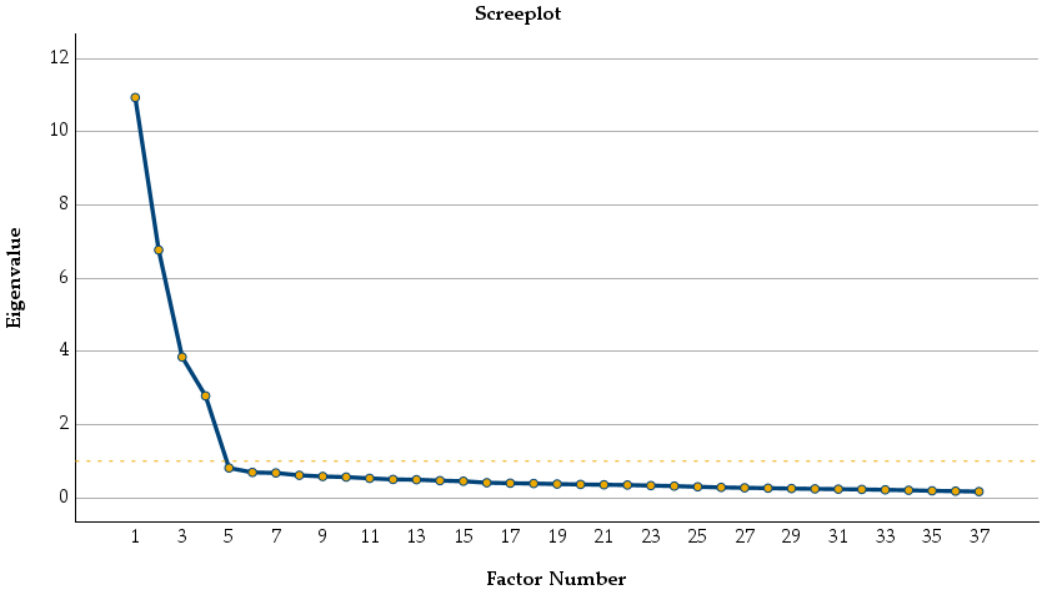
No.	Item	Item Description
V4 (2)	coloring of web page	The overall color style used on an e-commerce website influences my sight experience (pleasant / not pleasant)
V5 (1)	coloring of web page	The overall color style matching the product used on a website influences my sight experience (pleasant / not pleasant)
V6	coloring of web page	Gender-specific color schemes positively influence my sight experience (e.g., blue for men)
V7 (1)	key frames (images)	Key visuals that appeal to multiple senses simultaneously are important to my online product experience (e.g., nature scenery)
V8 (2)	dynamic images	Dynamic key visuals influence my sight experience (e.g., fast car driving on the street)
V9	mood video	Mood videos that appeal to multiple senses simultaneously are important to my online product experience (e.g., nature scenery in action, not presenting the product itself, but a scenery that matches the product's attributes)
V10	mood video	The graphical quality of mood videos influences my sight experience (e.g., resolution in SD, HD, QHD, 4K)
V11 (1)	Contrast of images / web page	The contrast on a website (e.g., dark products with light background and vice versa) influences my sight experience (pleasant / not pleasant)
V12	Surface (gloss vs. matt)	A glossy surface finish of products depicted in images on a website is visually more appealing (pretty)
V13	Handwritten Information	Handwritten information integrated on a website gives the graphic feeling of a more personal sight experience
V14	customer star ratings	Integrated customer star ratings are important to my online sight experience
V15	customer star ratings with references	Integrated customer star ratings, including explanations, are important to my online sight experience

Appendix 4. Scree Plots during EFA Investigation

Scree Plot 1 - six Factors



Scree Plot 2 - four Factors



Appendix 5. URLs used in Manual OSMI Field Study

- VW: vw.com/en/models/id-4.html
- tesla.com/modely
- ford.com/trucks/f150/f150-lightning/2022/
- gmc.com/electric/hummer-ev
- us.tommy.com/man-suits
    - hugoboss.com/us/boss-x-nba/
    - hugoboss.com/us/boss-experience/
- levi.com/us/shop-all/501-levis-7/8-jeans/p/362000167
    - nike.com
    - jordan.com/collection/air-jordan-12
- benjerry.com/
- haagendazs.us/products/ice-cream
    - nespresso.com/de/en/order/machines/vertuo/vertuo-next-dark-grey
    - nespresso.com/de/en/order/capsules/vertuo
- us.coca-cola.com/
- apple.com/iphone-13-pro/
- samsung.com/us/smartphones/galaxy-s21-ultra-5g/
    - microsoft.com/en-us/surface/devices/surface-pro-x/tech-specs
    - microsoft.com/en-us/d/surface-book-3/8xbw9g3z71f1?
    - hp.com/ch-en/shop/offer.aspx?p=b-hp-zbook-create-g7
    - hp.com/us-en/workstations/zbook-firefly.html

Appendix 6. Automatic Sensory Text Analysis Results

Filtering the top 15 Keywords per Algorithm using e.g. "gustatory" reference Keyword (Cosine Similarity)

	GloVe		*Keras*		*Word2vec*	
0	*taste*	*1.000*	*gymsharkface*	*1.000*	*delicious*	*1.000*
1	*delicious*	*.931*	*homeread*	*1.000*	*taste*	*.967*
2	*aroma*	*.927*	*repayment*	*.999*	*flavor*	*.883*
3	*fruit*	*.921*	*powerpoint*	*.998*	*tasty*	*.861*
4	*graveyard*	*.906*	*compact*	*.994*	*sweet*	*.840*
5	*flavor*	*.885*	*partial*	*.994*	*fruit*	*.823*
6	*gummies*	*.840*	*takeoutorder*	*.991*	*bean*	*.807*
7	*flavour*	*.835*	*hubwp*	*.990*	*roast*	*.766*
8	*sweet*	*.796*	*sand*	*.976*	*ingredient*	*.760*
9	*guru*	*.794*	*holidaysummer*	*.940*	*strawberry*	*.740*
10	*disrupt*	*.790*	*efficient*	*.913*	*lemon*	*.738*
11	*seasonal*	*.773*	*sxfktm*	*.904*	*deliciously*	*.712*
12	*lemon*	*.762*	*javascriptenable*	*.872*	*mix*	*.710*
13	*savoury*	*.758*	*unsweetened*	*.856*	*crisp*	*.694*
14	*tasty*	*.747*	*royal*	*.850*	*blend*	*.687*

BERT Results (exemplary Excerpt regarding Gustation)

	Text	*Nearest Sentence*	*Cos.*
0	*replace usual coffee vitaminpacked apricot smo...*	*A nutritionist recommended stevia as a natural...*	*.893*
1	*unmistakable taste aroma love good signature c...*	*Several Gevalia brand coffee's have been among...*	*.883*
2	*liptons natural green tea mint tea bag vibrant...*	*My favorite green tea powder!Expensive but wor...*	*.874*

Appendix 7. Code Excerpts of Automatic OSMI Approach

Exemplary Code-Excerpt regarding OSMI TF-IDF Calculation

```
file = 'file with tf idf values per website'
Function calculateOsmi (file)
        osmis_col = []
        For website in file
                osmis := {}
                For sense in website
                        If NOT Len(sense)
                                # no word for sense present
                                normalized_osmi := 0
                        Else If Len(sense) == 1
                                # one word for sense present
                                normalized_osmi := sigmoid (sense)
                        Else
                                # more words for sense present
                                normalized_osmi := MinMaxScaler (sense)
                        osmis [sense] := Mean (normalized_osmi) * 3
                Endfor
                osmis['total_osmi'] := Mean([osmis [mean_sense] For mean_sense in osmis])
                osmis_col.append(osmis)
        Endfor
        file['Osmi_Scores'] := osmis_col
Endfunction
```

Exemplary Code-Excerpt regarding Interactive-Media Detection

```
soup=BeautifulSoup(page.content, 'html.parser')
print(soup.prettify())

        [] <div class="page-header-container">
        <div class-"logo_container">
                <span class="logo_helpern>
                </span>
                        <a class="logo" href="https://360productviewer.com"›
                                <img alt-"" class-"large"src=
                                https://example.360productviewer.com/skin/frontend/rwd/driedee/images/logo_360.png>
                        </img>
                        </img>
                      </a>
                    </div>
                    <I-- Skip Links -->
                    <div class="skip-content" id="header-nav-desktop"›
                      <ul class-"menu" id-"menu-menu-klein">
                        <li class-"menu-item menu-item-type-post type menu-item-object-page menu-item-2769" id-"menu-item-2769"›
                          <a href="https://360productviewer.com/3d-product-configurator/">
                            3D Product configurator
                            </a>

#find IF 360 is in the text
soup.find('360productviewer')
print (soup)
```

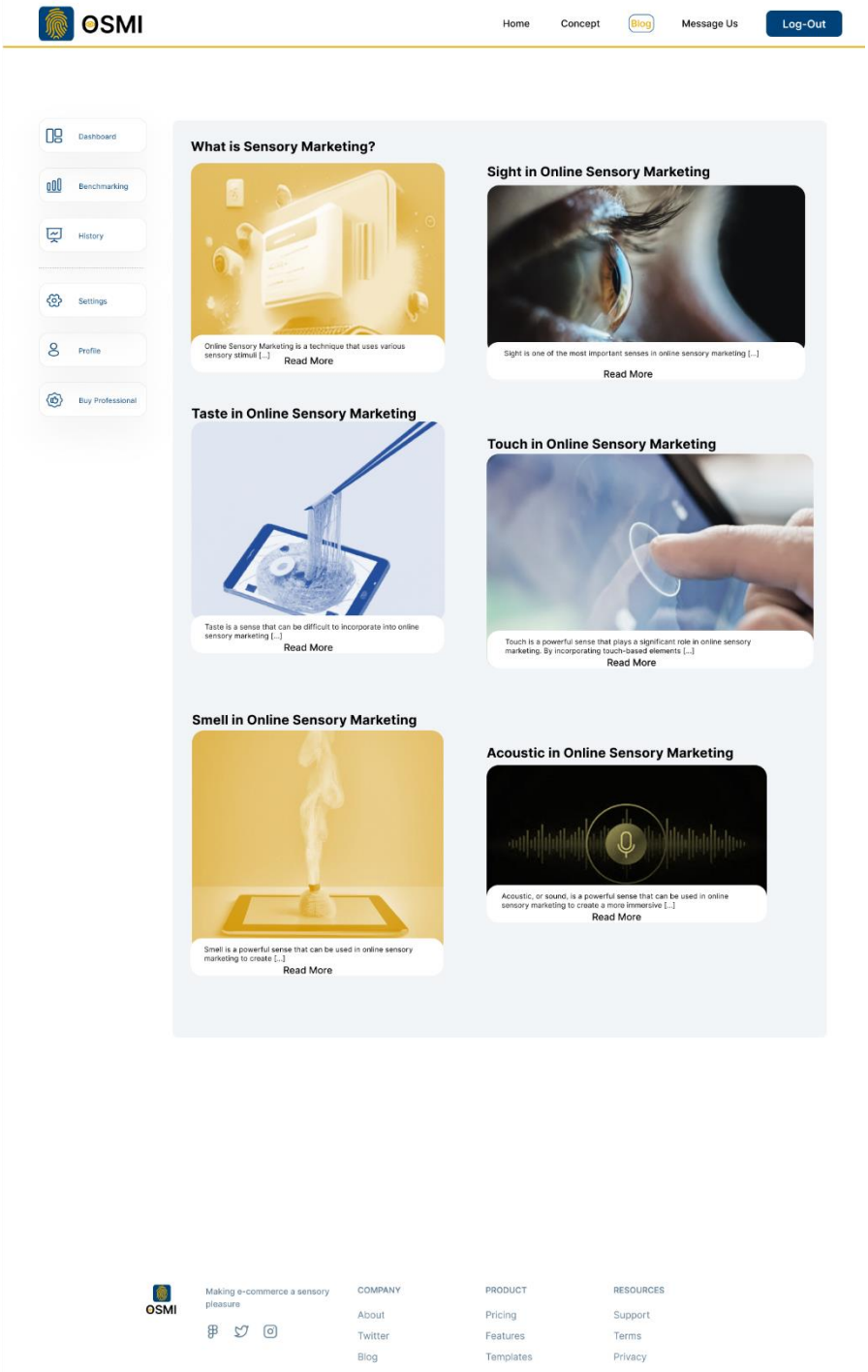
Appendix 8. File Attributes resulting from Image Analysis

Image Attributes resulting from machine-based Analysis stored in a CSV File

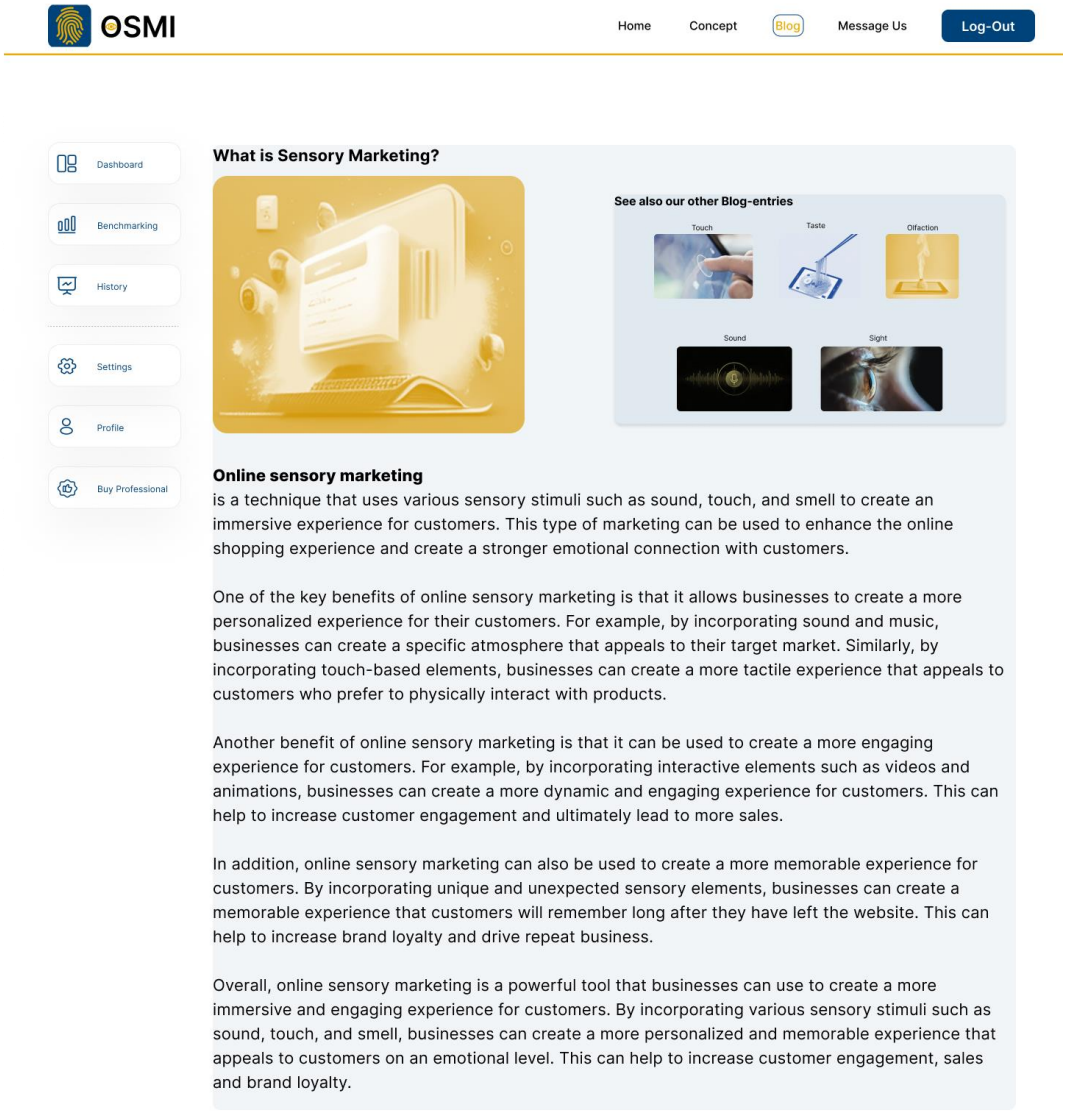
Attribute	***Description***
Sequence number	*unique identifier*
File name	*Name of the image file in SharePoint*
Company	*examined company*
Industry	*industry of the company*
URL	*URL of the requested image*
Size	*size of the image in pixels*
Height	*height of the array*
Width	*width of the array*
chanels	*number of color channel*
Indicator_v5	*Value of the OSMI indicator V5 (contrast)*
Dominant_colors	*Dominant colors of the image*
Yolo_objects	*Attributes from YOLO object detection*
aws_label	*Array with the label analysis results*
aws_faces	*Array with the face recognition analysis results*
aws_text	*Array with the text recognition analysis results*

Appendix 9. Artifact II Sub-Pages

Artifact II Blog-Posts Overview



Artifact II Blog-Post Example (Top of the Page)



Artifact II Blog-Post Example (Bottom of the Page)

Journal Literature Recommendation - Have a look at our recent research in the field of Online Sensory Marketing!

Journal of *Theoretical and Applied Electronic Commerce Research*

Go-to-Artikel:
https://www.mdpi.com/0718-1876/17/2/39

Open Access Article

Measuring Online Sensory Consumer Experience: Introducing the Online Sensory Marketing Index (OSMI) as a Structural Modeling Approach

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Open Access Article

The Application of Artificial Intelligence to Automate Sensory Assessments Combining Pretrained Transformers with Word Embedding Based on the Online Sensory Marketing Index

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OSMI

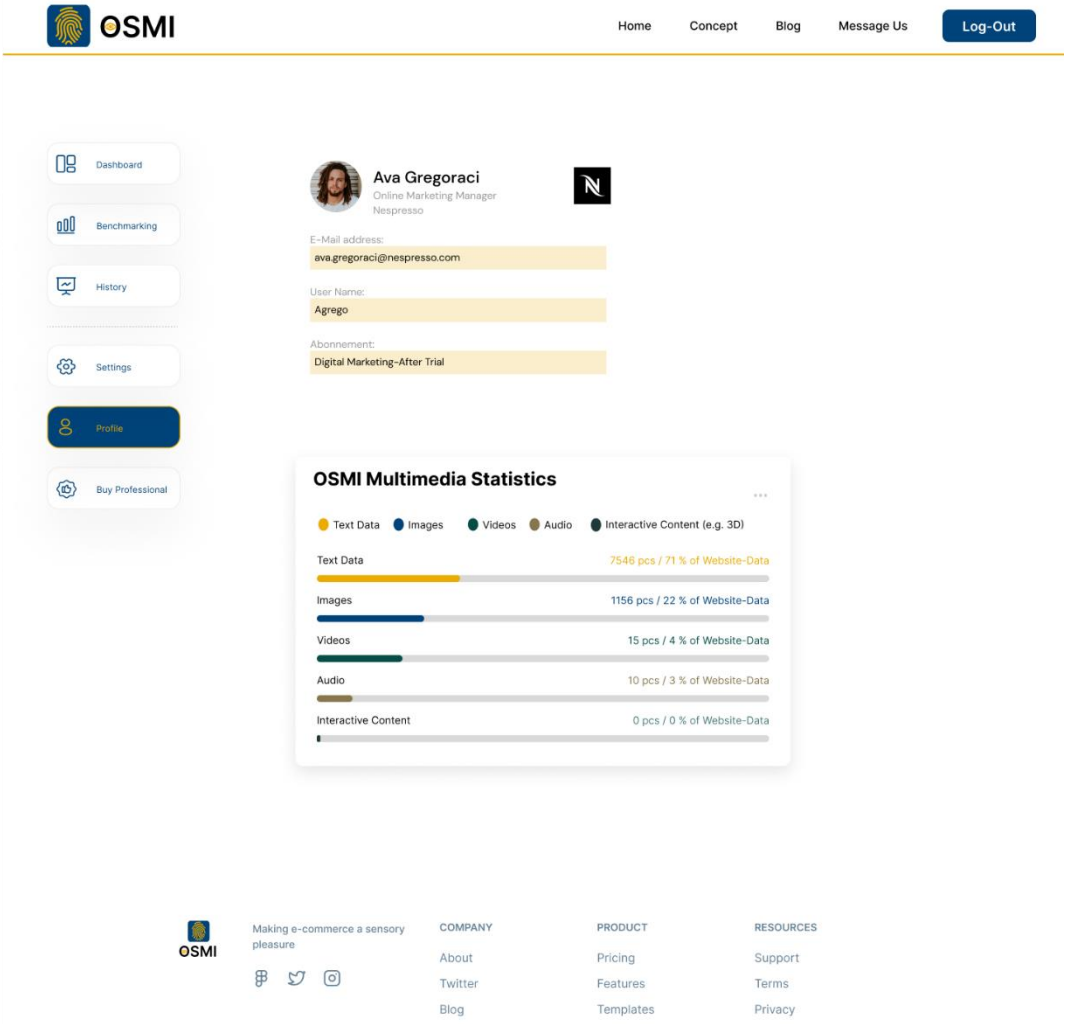
Making e-commerce a sensory pleasure

COMPANY
About
Twitter
Blog

PRODUCT
Pricing
Features
Templates

RESOURCES
Support
Terms
Privacy

Artifact II Settings Sup-Page



Appendix 10. Semi-Structured Expert Interview Guide II (Artifact Evaluation)

Domain	*IQ/ES*	*Interview Question (IQ)*
Usability	*IQ1*	*How do you assess the practicality of the mock-up in terms of its usefulness in a real/business setting?*
Information	*IQ2*	*How do you evaluate the satisfaction of your expectations regarding the specific information about sensory marketing quality displayed by the app?*
	Opt.	*Do you think some information is still missing or is any detail perhaps obsolete?*
Comparability	*IQ3*	*How do you assess the satisfaction of your expectations and business needs in terms of the industry-comparability function displayed by the app?*
	Opt.	*Which specific online sensory marketing components do you compare?*
General Statements	*IQ4*	*Are there any other aspects not mentioned so far you believe are essential for a useful OSM evaluation framework?*
	Add.	*What aspect stood out to you the most?*
	Add.	*What aspect did you dislike and why?*
Financial Impact	*IQ5*	*How do you assess the potential impact of applying this software to your daily business? Please rate in % according potential sales uplift*
	IQ6	*Do you consider any other financial impact by using sensory-enhancing content software?*
End	*Opt.*	*Is there anything else you would like to add?*
Expertise Statements	*ES1*	*I am a marketing expert*
	ES2	*I am a sensory marketing expert*
	ES3	*I am a web design / digital media expert*

Domain	*IQ/ES*	*Interview Question (IQ)*
Expertise Statements	*ES4*	*I am an e-commerce expert*
	ES5	*I am a marketing analytics expert*
	ES6	*How do you rate the artifact in terms of the potential to solve the raised environmental need?*
	ES7	*How do you rate your final expertise in the dissertations field?*

Appendix 11. Interview IP1 for first SSI

I. [00:00:02] Hello and warm welcome. Thank you very much for your willingness to be interviewed. First of all, thank you very much for your time. Good, then let's get started with pleasure. The interview is divided into three blocks. First of all, it's about you as a person—basically, your background. Here, the questions include how long and in what positions with what responsibilities or areas of responsibility they have already been working. Then it is about online sensory marketing. Both from your private point of view and once from a business point of view. So, from the latter in relation to your employer and your current area of responsibility. In addition, last but not least, it is about an evaluation tool for sensory marketing in the online area. We will also talk about whether there is a need for this and, if so, which components would be important. That is what it is all about, in summary. If you do not have any questions in advance, I would like to start with the first part. The first question is: How long have you been working in your current company, or can you generally tell us about your career?

IP1 [00:01:53] Well, my background is as follows, I started to study for my bachelor's degree after graduating from high school, and I was mainly in the field of business administration. I then worked for a tax consultant/auditor, and I continued to do that, although I switched to the marketing field during my studies. Now I'm working in an advertising agency that deals mainly with Amazon. I would say 95% Amazon, 5% is still a bit Otto, but for the most part, I personally also only have contact with the Amazon world. And in particular, our advertising agency is actually there to do all the advertising. So, customers come to us and say they'd like to do advertising on Amazon with display advertising, banner advertising, basically everything that's available on Amazon. I am mainly responsible for the content. So, there are several ways to present yourself as a company on Amazon. Among other things, via the product pages, where you upload images, texts, bullet points, and all that kind of stuff. But there is also, and this is also the most exciting part, as I find, where I also deal with the content, for the most part, the possibility to create individual stores on Amazon. You can then present iPhones, for example, and it looks similar to the Apple website but in the whole Amazon cosmos. And I am more or less responsible for the content. In other words, I write the texts, select the images, have contact with the customers, and discuss with them how best to market the brand on Amazon.

I. [00:04:26] Very exciting, I have to ask a question directly. Doesn't Amazon have something like that in-house?

IP1 [00:04:35] It's actually the case that Amazon is so giant right now, or maybe has been for some time, that Amazon itself doesn't care at all how products are marketed on Amazon. Amazon can simply afford not to care. All B2B customers who come to Amazon and act as sellers or vendors have two options on Amazon. Either you are a seller and sell your products from your own warehouse, or you are a vendor and have a warehouse on Amazon and sell your products from Amazon warehouses. But in both cases, Amazon doesn't care how the content is designed. Amazon offers tools for uploading content to Amazon and for advertising. Basically, the companies themselves are responsible for how products are offered on Amazon and how that is presented. And

that's why customers come to advertising agencies. As far as I know, there are about ten advertising agencies in Germany that only deal with Amazon.

I. [00:05:44] So, a relatively small field for such an important topic.

IP1 [00:05:48] That's right, very small.

I. [00:05:50] But can you approach as a vendor with this request? You said yes, Amazon is not actively doing this now, but could I, as a vendor/manufacturer, ask Amazon to do this now?

IP1 [00:06:08] Yes and no. So, Amazon gives you, if you have a contract with Amazon, depending on whether you want to be a vendor or a seller, there are platforms where you then also upload the brand store content, for example. Or there is something called A+ content. You can always find it under the products at the bottom. This is content that you can upload via these websites or the platforms that Amazon makes available. These are tools that we logically work with as well. Amazon provides these, and recently there's something new about this that we haven't worked with ourselves yet either. Amazon has put together a team that specializes in creating, let's say, "high exclusive" brand stores. You can then contact Amazon, and they will build brand stores according to your own ideas. I'll say, normally, with Amazon, you're bound to tools. You don't have an infinite number of possibilities. For example, what comes to mind is the Apple website. If you scroll through there, then the images go through one after the other. That's not really possible on Amazon. But if you say, okay, I'm such a big brand now, I have such a big traffic, and I'm also willing to put a lot of money in my hand. Then you can contact Amazon and ask them to do it. That just applies to very few brands.

I. [00:08:02] I see, but very interesting. I think that's exactly right for today's topic as well. Do you then have anything to add about yourself that you can think of off the top of your head? Otherwise, I would move on to the next topic.

IP1 [00:08:16] Apart from the fact that through my work and my studies, I have, of course, also dealt a lot with the topics of online marketing and sensory marketing, I can't think of anything that I've forgotten. But I think we'll get to that in a moment.

I. [00:08:30] All right, then let's also jump right into today's topic, which is sensory online marketing. The questions that I have prepared for this are as follows. The first would be: How do you actually personally go about shopping online? So, looking at your own customer journey from the moment you're already on a platform, how is your own behavior there in terms of, for example, addictive behavior and click behavior? What components do you pay attention to there? To put it briefly, it's best to describe how you proceed yourself when you want to store on a website.

IP1 [00:09:03] So basically, even though the question relates to how one's own behavior is while surfing an e-commerce website, for me, it starts earlier. For me, it's actually now from the beginning. If I'm interested in products, I do some research in advance. For example, I find that technology is somehow special because then I

look at a YouTube video or test report, just everything you can find about it. When I'm on the e-commerce website, the most important thing for me personally - and this is perhaps also a bit of branding that you can't quite figure out - is this Apple lifestyle, so to speak, that it's clear. You're not bombarded with content. So, you don't feel overwhelmed as someone who visits the site. You're not overloaded with banners from all sides, or ads are displayed here and there. So mainly this, that I have a good overview, where I also feel comfortable. If I then look at such a page and then also relatively promptly find what I'm looking for. I have a good layout at the top, and I can also search for things quickly, in my opinion. So, if I'm really looking specifically for an iPhone 12 or 13 above, I can find it directly. It doesn't take long, and I don't have to click through 20 pages. Those are the first things that I think if I go to an e-commerce site now, that appeals to me.

I. [00:10:41] Okay. Now if we stay with your Apple example, what components are they using there, so what content just appeals to them the most?

IP1 [00:10:48] In terms of products, right?

I. [00:10:51] Generally. So, the content that gives you, as you just also mentioned, a good feeling. If you relate that to the content, then the question would be what are the elements that trigger that good feeling?

IP1 [00:11:05] I would say mainly the high quality that Apple is trying to market or sell with the content. That's where they usually always work with exclusivity. And depending on that, if you look at the Pro models, it's usually always kept relatively elegant and not too playful and too colorful. That's more in the lower price segments. In general, however, when I look at an iPhone, for example, I want to see at a glance what the phone will do for me if I buy it; what will I get out of it? What features are supposed to make my life easier with it? And when I find the information in a bundle, without having to spend ages looking for it, then I have this good feeling. If I want to know, for example, is 5G or 4G installed in it? And what Apple does well, of course, is the emotionality that they want to convey with texts, pictures, videos, and so on.

I. [00:12:14] Okay, thank you very much. Then we already go to the next question, and this would be: Do you think that consumers can have comparable, not necessarily identical, but comparable sensory experiences when buying online if we just contrast that now with offline buying when you go to the store? And if so, do you have an example?

IP1 [00:12:40] I would say yes, of course. I'm also a bit prejudiced by my background. I have dealt with this topic myself. As far as sensory marketing in the online sector is concerned, I would say that there are possibilities. And I would also argue that most companies know about it as well. Otherwise, they wouldn't apply it so explicitly in their e-commerce space. If they didn't know about it, for example, I can't imagine that it's always a coincidence. And I would already say that, especially with sensory capabilities, while it's obviously difficult to get that exactly right, as it is possible offline. But I mean, especially in the Corona era, which is now behind us, online has become increasingly important. Companies have certainly come up with ideas about how we can somehow transfer this

experience from offline to online. And if I were to think about examples from my thesis, for example, Magnum ice cream immediately comes to mind. What I found really interesting was how they managed to transfer this experience of eating ice cream, which you can try out in the supermarket, for example, and take a bite out of a Magnum ice cream, to the online world, how they managed it, via videos and photos or even writing or dialog. This USP that Magnum has, with the crunch, the feeling, the smell, everything that goes with it, and of course the taste. I thought it was very good that they managed to transfer the USP to the online world, and in my opinion, it's also a sign that it works and is also perceived and used by companies.

I. [00:14:24] All right. What sensory components or content do you personally pay attention to when shopping online? Consciously or unconsciously?

IP1 [00:14:32] Unconsciously, of course, it's always difficult to reproduce that because you don't usually notice it. But especially with the things that you consciously notice, I would basically say that it depends a little bit on the product. So, for example, if I choose a cell phone now, I probably won't care, or I won't unconsciously or consciously look for how it smells or tastes. Or probably I will also not necessarily pay attention to it, If there is now, for example, a picture of a child, which is photographed with a new iPhone and holding an ice cream in his hand, I will probably not think about it myself, how this ice cream tastes now. But maybe subconsciously, it's something you can't perceive right away. But especially with an iPhone now, for example, it's the aspects of how it lies in the hand and feels. You might see a picture of a person holding an iPhone in their hand and have a size comparison. I would say that the visual is the most present factor in online marketing anyway. As a rule, you can't switch that off. But also, the acoustics. Especially when I watch a video on a website in which the product is presented, in my opinion, these are the decisive sensory factors in e-commerce.

I. [00:15:56] Just to complete that. What would you say about the importance of texts in this context?

IP1 [00:16:02] Texts can definitely be important as well. Especially to reproduce the sense of smell and the sense of taste. Because that's theoretically not possible via laptop or PC or mobile to reproduce somehow, but if you manage to describe it reasonably, then, of course, that's the most important thing. For example, in the case of Magnum or something like that, if you think in the direction of the food industry or perfume, then these are two extremely important characteristics you must try to reproduce online, such as how a perfume smells. That's why I would say that texts are also very, very important, depending on the product category.

I. [00:16:59] Okay, and if we now contrast sensory content with say hard facts like price, delivery time, availability, etc., how would you rate it there in terms of importance in the individual buying process? So hard facts vs. sensory content? Where would you rank the latter?

IP1 [00:17:16] That's difficult to classify, I think. I would maybe sort it a little bit into haptics. So, if you get hard facts about a product, then it fits in the area of haptics in that for example, the fabric is described in more detail.

Among other things, hard facts are perhaps size, width, length, whatever. That's how I would classify it, perhaps, or a little bit overlapping with the communication that arises around the product.

I. [00:17:54] Okay. But what I really meant by the question was, how important do you think sensory content is in the online buying process? How important do you think sensory content is in general versus the hard facts that I was referring to?

IP1 [00:18:06] Oh, sorry. So, I think actually very important, because depending on the product I would also say that it always has a lot to do with emotionality. So just if we stay with the Apple example. Apple, of course, works a lot with emotionality, also in terms of the brand. And I could imagine that there are also many people who buy more from an emotional point of view instead of really reading through or looking at the facts, the hard facts. I guess if you really only look at the hard facts, you probably wouldn't go for the iPhone every time, but maybe buy a different phone. Of course, this emotional aspect, which can be conveyed via the sensory, is extremely important.

I. [00:18:51] All right, okay. The next question would be: In your company, so also in your daily work, do you already pay attention to the topic of sensor technology in the online area? Is this generally an issue, if applicable, even in your work in the Amazon area?

IP1 [00:19:20] It's definitely a topic, but it's not like you put a to-do list next to it and then work through every single point. That you look, okay, I now have the sensory system with the olfactory system, the gustatory system, etc., and I have all of that in there. It's not like that. It's more like keeping it in the back of your mind and asking yourself, for example, which product you're dealing with at the moment. When you try to put yourself in the customer's shoes - how do they react to the website or the brand store that they're looking at? And then, of course, with Amazon, you have a bit of a problem in that you find yourself trapped in a tool like that. I mean the content tool that Amazon provides us with. There we have the possibility to upload images, texts, and the like. But even there, we have strict guidelines from Amazon. For example, the first image on a product page of Amazon must always contain only the product with a white background. Say to Amazon itself, there are many specifications. That was only one of them. If I now list Amazon's specifications, we'll sit here for a while (laughter). But of course, you always try to represent the brand in a way that best benefits the brand. And it certainly makes sense to take sensory issues into account. It's just that you're always a little bit tied in, which Amazon allows. It looks different, for example, from what I just told you, when you contact Amazon for really big brands, and then you are completely free. Of course, there is still the possibility to pay a little more attention to sensory content.

I. [00:21:13] Okay. I want to go back to the details for a second. Is that important to you personally now in your daily work? Because you said it's something you think about in the back of your mind. Nevertheless, is it something that your colleagues also do the same way? Or is it because you have the background?

IP1 [00:21:27] Sometimes it's actually quite interesting with us. We're just really building out this content area with us. Mainly we were dealing with advertising, and my employment sort of had the consequence that we slid into

the content area, so I was more or less appointed content manager on paper. In the meantime, other people were hired as well. We have also hired graphic designers who are now also involved in this, and the bottom line is that I usually come up with an idea and try to communicate it to the graphic designer so that he can implement it. Accordingly, my background also comes into play.

I. [00:22:01] Ah, okay, I see.

IP1 [00:22:03] But it's definitely the case that I then raise objections. Recently, for example, we discussed marketing smartphones to seniors, which is a bit of a niche. I also raised the objection that we should ensure that when we depict the smartphone, for example, a hand should still be visible. That means creating and using content that shows the smartphone in use in one hand in order to incorporate the sensory and haptic aspects. That's how we're currently doing it, and our goal is to expand the content area even further over the course of the years.

I. [00:22:49] All right, now I also understand the context in your company, how this basically works for you. Then let's move on to the next question. Otherwise, one of the key questions would be the following: Do you think it makes sense, in principle, if you could have the sensory communication quality on a website, which could also be Amazon in this case, evaluated by an online tool and possibly even have this online tool show you potential for improvement? Would that be something where you would say that it would make sense, maybe even that you would use it if something like that existed?

IP1 [00:23:18] Yes, definitely. I think if I were to deny that now, then my previous statements wouldn't have made so much sense either (laughter). Accordingly, I would say yes, definitely. So, it's always the question, of course, how to use or apply the tool. Now for example, on Amazon, it's always something else than looking at your own website, where you can determine everything yourself and decide how that works. But definitely, especially if you start somewhere in a company or now in an advertising agency like me, for example, where not everyone has this background. Most people by now have bought something on an e-commerce site, and you subconsciously pay attention to these things, to the sensory. But even if you're responsible for building that content on the corporate side, you might not have that in the back of your mind. And from my point of view, it would be helpful if you could run a tool over the page, so to speak, that would point out that there is still potential for improvement in this area or another. I do believe that, especially in e-commerce, where it is becoming more and more important today to somehow set yourself apart from others, using such a tool can actually be a way to do that.

I. [00:24:03] While we are on this point: do you also compare the communication quality, i.e., images, texts, etc., of the competition?

IP1 [00:24:08] Yeah, definitely. So, we look at the competitors, of course.

I. [00:24:12] Probably unconsciously, but also specifically in the area of sensory communication? That you look at how the images are also designed in this respect or the texts, so generally the content?

IP1 [00:24:21] I think, as you say, it's always difficult, of course, whether you compare subconsciously or consciously on the company side. But what you do consciously in any case, I would say, is that you look at pictures and compare. Of course, it also depends a bit on how they are presented. So, whenever you buy an expensive product, for example, or decide to buy an expensive product, you also want to get a kind of exclusivity conveyed on a website. That you want to see yourself confirmed that this purchase is the right one. If I find out on a website that somehow everything doesn't match the pictures, that it's dubious, or whatever, then I'm probably more inclined to buy a different product when I've compared it. Accordingly, we also make sure that the website matches the product.

I. [00:25:01] Since you have confirmed that it would make sense in principle to develop such a tool, I would like to ask you a little bit more concretely about this. Namely, on the one hand: How would such a sensory evaluation tool have to be designed to be practicable in your view in everyday work? So, the question is aimed in the direction of design/usability.

IP1 [00:25:24] What I could actually imagine now would be a kind of plugin in an online browser. That you can download this. There are already numerous plugins for various browsers. I imagine that you can open the plugin for the tool at the top of the browser without much effort while you are calling up a website. I don't know what can be technically implemented, but I think it would be good to give the program a certain time to analyze the website and then get a small output about it in this plugin. For example, how is the website, what is its ranking, and how is it rated. If one then really deals more deeply with it, I could imagine that one could still go into an analysis area of the tool. In this area, one would then really explicitly learn the individual ratings for it, and perhaps also that individual images, videos, or texts are dealt with there. I imagine it could be very useful if designed that way.

I. [00:27:06] Okay, by the way, do you already use comparable tools that are not related to sensory communication but are generally performance-related or analytical tools?

IP1 [00:27:19] I don't know if this goes precisely in that direction, but at work, for example, we also have several plugins that we work with. With these, we can then see, for example, the traffic from the product. I can see at what time the product was expensive. Theoretically, you can't see that as a normal user. I can also see how often the product was bought and things like that. All this is possible with these plugins. In this direction, I can imagine the sensory tool because it can be used directly in the website and does not have to be opened via an external program; maybe it has to run on the side but works directly in the browser.

I. [00:28:05] Okay. The plug-in would probably be for an initial indication, so with the score, as you said. That's also aimed at the next question, which is as follows: What specific information about sensory communication quality would you like to see in such a tool? In terms of sensory communication, what information would such a

tool need to be able to show you? So, if we divide this in two now, at the beginning, probably, as you suggested, a general score with the first indication. What else would have to be displayed there?

IP1 [00:28:38] As a first overview, I would say there should be a summary of the five senses and how they are rated, for example, on a scale from 1 to 10 or in percent or whatever. So, a short overview of the five senses, and then you can click either further down or directly on the respective sense and then perhaps learn a bit more explicitly why this score now comes about precisely with the respective sensory. That is, why do I now have, for example, only 4/10 scores for the gustatory system on the website. And then perhaps an example in the website itself, why this score has come about. Then also with regard to the weighting of the senses per industry. So that you can tell the tool, or click on it, what kind of page I'm on, what kind of products it's about, and that you can then also incorporate a weighting. For example, on a website with electronic products, visuality and acoustics are more important than the other senses, which also influence the ranking.

I. [00:29:41] Okay, do you mean direct improvement options with this?

IP1 [00:29:48] Exactly, exactly. Whereby one would see that also theoretically in the score. But then you could maybe add an example that would improve the score.

I. [00:30:04] Yes, okay. Are there any other criteria that you can think of now, ad hoc, that such an evaluation tool would have to fulfill? I'll just give you one example that comes to mind, which is comparability to other websites, which is also my next question. So, imagine, if necessary, also with Amazon in terms of customers. Would that also be something that makes sense?

IP1 [00:30:26] Yes, absolutely. It's just a question of which brands you compare yourself with. It would be conceivable that you simply compare yourself in each industry with, for example, the biggest player or with competitors that you have chosen yourself with whom you want to compare yourself. For example, if I were a smartphone manufacturer, would I be compared with Samsung and Apple, or could I choose for myself which brand I wanted to compare myself with? Those might be some other ideas or what I can think of now. Just in terms of comparability.

I. [00:31:01] All right. Moving away from comparability again now. Are there any other points that you can think of now when you think of an assessment tool that is supposed to capture the sensor technology in e-commerce, evaluate it, and in the best case, even make recommendations? Is there anything that comes to mind spontaneously that we haven't discussed yet?

IP1 [00:31:14] Well, as I said, just that, the weighting would be important to me. So that you can tell the tool which industry I'm in now, so that can also be considered in my evaluation. Which in turn can also lead to better comparability with other industries. Apart from that, I can't think of anything else offhand. Especially the comparability and the weighting would be important from my point of view. Otherwise, I wouldn't have any further points right now.

I. [00:31:44] Okay. Well, then, I would say we've actually come to the end of the interview as well. Unless you now have something else that spontaneously comes to mind in general with regard to the fields of technology that we've discussed?

IP1 [00:31:53] I don't think so. I'll think about it again. I wouldn't have anything specific right now where I'm still saying, I need to get this off my chest right now; we haven't discussed this yet.

I. [00:32:06] Great, then thank you very much for your time and your answers and have a pleasant day.

- End of Interview -

Appendix 12. Interview IP2 for first SSI

I. [00:00:00] Thank you very much for agreeing, and I'm also happy to start directly with the questions. The first question would be: What is your employer's name, and how long have you been there?

IP2 [00:00:18] Hm. My current employer is Volt Venture GmbH, with the brand Clevertronic, which is perhaps a bit better known. It's a big start-up from Münster, so it's been on the market for 13 years now, and it's in the re-commerce sector, so it's an online store - I always like to say it is a competitor of Rebuy. People can then imagine something under that. In other words, buying and selling in the electronics sector which also has a sustainable focus because it's all about giving electronic devices a longer life. I've been employed since February, so not long ago, as a team leader in product management and e-commerce, and before that, I was an e-commerce manager for seven months.

I. [00:01:08] So, do you also have professional experience in eCommerce?

IP2 [00:01:11] Yes, so not so forever now, but yes.

I. [00:01:15] So you've been there since last April?

IP2 [00:01:20] Since July last year as e-commerce manager.

I. [00:01:24] And before your current job, what jobs did you do?

IP2 [00:01:27] Before that, I was a marketing project manager for three and a half years, and I studied dual studies in a company, part-time studies, and then I was a trainee in business development, I worked as a development manager and then as a marketing manager. So, I've already been through a bit of a process.

I. [00:01:49] Yes, I believe you immediately. I also looked at the site your current employer operates, and it's exciting and well-known. I hadn't yet realized that a company from Münster operates this website.

Then, the next question would be: What are your daily tasks at your current employer?

IP2 [00:02:12] Hm. Actually, these are very, very, very versatile. So, one of the things I'm more responsible for is project management. That means I lead the team that works on the operational side. These are very classic things like product management, item creation, item maintenance, and a lot of pricing because the market in which we operate is very price-sensitive. This means that we really do have to keep a close eye on current price trends - you could say every second (but of course, it's not that extreme) - and adjust accordingly, or even give our own impetus to the market when we have the right devices that are ready to find new owners. So that's the whole operational side of it, which includes ordering accessories. What will be a bit more exciting is the strategic product management, which is about figures, where it's about orientation, where it's also about how we want to / should change the presentation in the store. That is also the topic where we will probably talk about it. For example, we did a redesign of our store in December, the one before that was "90s style", I would say. This one has now become a bit more modern. This also includes improved usability, and I'm working on that in consultation with IT. A web

designer is also part of my team. I always talk to him about what we want to change. Yes, and then finally, the topic of performance marketing, that is, how we can improve our online presence. That is, of course, very, very much Google Ads and other platforms for marketing. Um, yes, I didn't list SEO, but it's a classic marketing topic. So very, very, very versatile. We are also in the process of structuring that further. We are growing strongly precisely because so much is on the table. We could do much, much more in many areas if we simply had more time and resources.

I. [00:04:32] Very exciting, I must say, very interesting. How many people do you have in your team?

IP2 [00:04:41] That varies. We also work a lot with students, and currently, there are six students and two full-time employees. In the next four weeks, four more full-time employees will start because we're growing so much because the need is there and because also at the beginning of the year, two left whose positions are still vacant. So, it's always changing, constantly.

I. [00:05:10] It's very nice to see something like that develop. Then, we also come directly to tonight's topic, sensory online marketing. The questions also go a little bit into their own rhythm of how they would act themselves. That's why the first question is: How do you personally go about shopping on an e-commerce website now? So, what is your search behavior/click behavior? What do you notice? What do you pay attention to?

IP2 [00:05:45] Well, sure. So, for me, it always depends a little bit on my own situation. Do I want to be inspired now, so to speak? Have I seen something somewhere? Whether that's clothing or somehow a bag or something where I want to browse a little bit, it's then rather a little bit like that I go to a page, maybe even on the home page, for example, click on a banner or something, because I think that interests me. Sometimes, it's even more like a bit of storytelling, where I can find out about it and then go there. But if I know directly what I want to buy and if it really has to go fast, then I go to the online store and use the search, and if I don't find it directly, I'm actually frustrated. If I find it, then I buy it directly. If I want to buy something quickly and I don't find it right away, then I cancel it and put it off. So, then it can also be another store if it does not lead directly to the conclusion.

What else do I pay attention to? Especially for the first search described, the experience is, of course, very crucial. That is, the page is appealing. You also talk a lot about this white space. I always find that very pleasant when it's not so cluttered. When I know what I can focus on, it's not a thousand pieces of information. I don't find that pleasant, then, to be inspired. That means the design is crucial, and when it comes to the inspiration, then, of course, it's important that I can also imagine the product. So, if I do not even know what I'm looking for, is it, for example, a bag, then, of course, it's cool if I see exactly the color; that I could read up on the properties in case of doubt, maybe also have an application picture. Especially this I personally always find very convincing, if, for example, I see someone, so a picture of someone who wears the bag or who has combined the clothes or similar.

So far, I've mostly only seen pictures when I was searching myself. Of course, if then times a video is there, then that's also cool. But that really depends on how much time I have or whether I am now really very strong on this

first path of inspiration search. Or otherwise, I would also actually not always look at it. Depending on how long or how fast the video loads, especially when I'm on the train and want to look quickly on the phone. What else is important, or what do I pay attention to? What I haven't mentioned yet is, of course, the price. It always depends on what I'm looking for. If it is, for example, also a gift, what we want to give a friend in the circle of friends, it does not depend on the last euro. But if it's somehow something that I don't necessarily need myself, then I think about it, then I'm more price-sensitive.

I. [00:09:13] All right. Then, I'll go directly to the next question: Do you think consumers can have comparable sensory experiences when buying online? For example, touching - that's not directly possible. But do you think there can still be comparable experiences compared to "offline," even online?

IP2 [00:09:37] Yes, I definitely think so. So, I think there are a lot of factors to consider. But I think that generally, the experience online, by that also a lot of things are more controllable - for example, when I'm offline, there are other people, it's a different volume. Sure, temperature and light you can control everything, but it's dependent on so much else. I believe that, so in conclusion to your question: Yes, I believe that.

I. [00:10:08] You mentioned a very interesting point that I hadn't really thought of, namely concentration, the targeted sensory experience of things. Yes, you can control it quite differently, as you say, than it is offline, for example. In the store, so to speak, because there can be disruptive factors or possible disruptive factors.

IP2 [00:10:29] Exactly, the other way around, of course, you don't know where people are when they store online. There, you have the effect even less under control because I can be on the train; there, it can be just as loud. So, I think that we humans can't really separate that. If I'm on the train, for example, and it's loud and smelly because of me, and then I look at an online store, then I don't think you can completely separate the two, but the experience is the same, and of course, that plays a role. But if you focus on the pure experience online, then I think you can control much more.

I. [00:11:06] Do you have a concrete example of something that you can think of ad hoc right now that you can also experience online. So, a sensory experience that is well possible online?

IP2 [00:11:19] Yes, so in my master's thesis, I wrote about the haptics of textiles, and first of all, I think it's very far away. Of course, you can't feel online, at least not yet. The technology has not developed that far yet, and I think it's even further away than other virtual possibilities. However, similar to a classic mirror, when I see someone else somehow touching something, using a product - classic advertising - and feeling good about it, I think the most important experience comes across when it's done well. And whether it's someone who picks up a substance and describes it, as I did in my master's thesis, or whether it's someone who consumes a drink and reports on it, the emotions and feelings become clear via images, video, and sound. So, just because I think that's how we humans learn and experience about others, I think you can definitely mirror that online.

I. [00:12:40] Ah, ok. Then, let's go to the next question. However, I think they've already anticipated this a little bit, but we can keep it short. Because the question is, what sensory components do you pay particular attention to when you're shopping online? Consciously or unconsciously? I've just heard that you pay particular attention to images and to texts and videos when there's time - that's how I noted it.

IP2 [00:13:10] Exactly, you've summarized that correctly. So, I think that videos transport the most because just sound and image and moving images are mixed above all. But I think that currently, there is not yet a good solution to integrate that into the online store. That is, the experience is embedded. But I could well imagine doing it like Apple, and I hope that doesn't digress too much now. But if you go to Apple landing pages when they have a new product launch and you just scroll down a bit, you know that. It's annoying when you quickly try to find out how much memory this device has, for example, and you have to scroll, scroll, scroll. But the experience is just super rad because there's always a bit of moving image; it's information. It's a very intense design feeling. And I think it's very well mixed: you see the product, you get information, you're in the experience world, and you see not only the product but also the design around it. And - I haven't even mentioned this yet, but what I think is very well done is that you are active yourself. It's not like I click on a video, and it plays, but I scroll and kind of decide where I want to see more. Or I can quickly scroll further or scroll up again. And I think that's very well done. I think that's one of the best examples, but I think the original question was what do I pay attention to myself, right?

I. [00:14:58] Right, what sensory components do you pay attention to yourself in online shopping, for example?

IP2 [00:15:02] Well, I have to say, I'm not an Apple user, but I think the presentation is very good.

I. [00:15:10] I see. Let me think about it. I think Samsung, for example, is now also doing quite similar to Apple. Does it match better for you?

IP2 [00:15:27] Ah, okay, then one has led the way, and the others follow suit. Yes, exactly; what do I pay attention to? For me personally, the design of the store is very, very important. I think that depends on me as a person because I also see that with one of our target groups, where I now work, the design is often not that important. It's about the technical component, the information, and the price. Personally, to me, however, it is very important, so the experience. I would say that I trust a store whose design is good. That's not enough for me to trust it, but that's the first point because I think that if you have an online store and you don't have a good design or a suitable approach for the buyer, then you've done something wrong, in my opinion. So maybe you don't take it seriously.

I. [00:16:27] Now under design, what would you consider in detail?

IP2 [00:16:36] Well, really, the overall impression, the arrangement.

I find that, actually, the information is secondary. It's that first impression and a little bit of how I feel about it while I'm looking for information. So even if I haven't found what the product describes to me yet, I already have such an impression of the store. It's a bit like the offline world when you go into a store. For example, you already know that it's a store for handbags, but you haven't yet seen the product and don't yet have any product

experience. You already have a feeling for the store, for the high quality, and even for the price structure. I think you can also play that through the design. And I think good design doesn't always mean it's expensive, but it can also describe the price-performance ratio.

I. [00:17:26] Very interesting - you've already mentioned the word price structure several times. That brings us to the next question because this would be: How important do you find sensory content in the individual buying process compared to, let's say, "hard" facts, such as price or delivery times? Something like that. People are very spoiled now, for example, with the delivery times at Amazon, with next-day or even same-day delivery. Is that the decisive factor, or how would you classify that in terms of importance in the overall context?

IP2 [00:18:16] Well, for me personally, it depends very much on the product.

If it's an everyday object that I buy anyway, then the whole experience isn't so important for me, but the price structure and, of course, the information, because I want exactly what I have in mind. I've never ordered toothpaste online, for example, but that would be a classic example for me where the price is more decisive than the multisensory experience. But - and this is the first way I mentioned at the beginning, namely inspiration (being inspired) - the sensory experience definitely plays a big, big role for me because you can see the difference there.

Especially in the search for inspiration, in my opinion, one has not yet decided, and then it is crucial which elements are played, when they are played, and how they are played.

I. [00:19:22] I find that a very interesting statement from you. So, I'm just thinking, it's not on my note like that, either. Is that basically involvement? What do you mean by that? Well, if you think about your example with toothpaste, you don't spend a lot of time on it. It's a consumer product that you buy quickly and for which the price is decisive. And the more expensive or emotional the article or the product of desire, the more attention is paid to sensory components. Is that right from your point of view?

IP2 [00:19:57] Yes, that is scientifically summarized very well.

I. [00:20:03] And then there is a next question: How is the topic of sensory communication dealt with in your company? So, is it basically taken care of in the daily work for selling consumer goods like cell phones? What is the context of your company?

IP2 [00:20:39] Yes, I had said that, at the moment, we have a resource bottleneck in our product management and e-commerce department. That is, right now, I would say it has no priority as a separate topic, I would say, but what I find is that the topic is reflected subliminally very often.

So, especially when it comes to the customer experience, when we notice that the conversion goes down. If a lot of people are in the store but don't buy, then it also has something to do with that. And then, we look at whether we are presenting the product correctly. Of course, the first thing we look at is the price, and it's right because it's a price-sensitive market. That is actually the decisive criterion for us. But yes, and subliminally (sensor technology) definitely plays a role. I would like to see that one be even bigger. But I think it's because of the product, because

every one of our customers has certainly had a cell phone, or knows a cell phone, knows how a cell phone feels in the hand, and knows roughly the dimensions as well. For example, we don't have any pictures of someone holding the phone in their hand. We just have the product pictures. We also don't have what Amazon often does, for example, by placing a folding rule next to it so that you can estimate a little bit. We don't have that at all. And I don't see that as a high priority for us with the products right now either because that's not what you need to buy these products, in my opinion. So that would be the thing that could certainly be optimized, but it's just not prioritized by all the other issues.

I. [00:22:30] And then, because they're just already bringing up the topic of optimization as well: So, it's the second big component of the Q&A, which is to create an assessment tool. If there was something like that, would you find that useful? If you were working with that, would that help you?

IP2 [00:22:53] Hm, yes, I think it makes a lot of sense because so many different factors come into play. I just said, we don't have so many resources, and if there was this tool and they would say "Hey, we analyze the website once and can say how the multisensory perception is possible for the customer" - that would help us, of course, preferably with direct optimization possibilities. So preferably not just a grade, for example, a 3, but the coolest thing would, of course, be to know where we can optimize. I think this is a very sustainable topic.

I. [00:23:36] Yes, ok. So, let's jump right into that as well. Maybe you can talk a little more in detail about how such an assessment tool would look or be designed. So, the keyword is design. What is particularly important to you that it is also practicable in your day-to-day work?

IP2 [00:24:01] Hm, yes, when I think about it, I imagine that this tool gets an instruction, so to speak, about which product it is that should be evaluated. And yeah, that it's maybe set up a little bit like a crawler like that. From the start page, the crawler should then perhaps recognize where it has to go, so to speak, it clicks through the page like a human being to get to the product, and there it is then evaluated how good the usability is, which sensory content is shown and how is it perceptible. So that's how I imagine the tool. Now, of course, I don't know exactly how to build the tool. But as the crawler goes through the website, it should collect all the data and then evaluate at different points how good the multisensory communication is. So, for which senses something is perceptible.

Usability is, of course, always a big buzzword. But I would find it quite practical if this were to be included in the tool. I think you can't separate it because even if I have the maximum sensory experience, it doesn't necessarily mean that I will get to the product the fastest. That I'm getting the information that I need. So that's actually what I imagine the difficulty of the tool is as well. Of course, you can evaluate how many senses are used, but you must also know whether it makes sense. And I think you had already talked about the categories, and I think for that, it's important that you can maybe categorize the product. Because the multisensory experience for products is always necessary in different ways. I had already said that we also sell in the cell phone area without representing how someone has it in their hand, what the emotions are. Or that we describe via audio how the feeling is and so

on. Still, it might be cool, but it's not mandatory. There are other factors that are more important there. I think I've digressed a bit here.

I. [00:27:04] No, no, because what you're talking about is basically an industry-specific importance. Of course, there are different sensory requirements for selling a cell phone versus coffee or any other daily-use items. That's completely different, of course, so the tool would have to reflect that, as I noted in your answer. But at the moment, this tool also does not yet exist. That's why we're currently in the process of determining what practical requirements it should actually fulfill. Your answers are extremely helpful here, and at the risk of repeating a few things, you can then answer quickly. So, the next question would be: What specific information about the quality of sensory marketing should this evaluation tool be able to display? What information would you want exactly?

IP2 [00:28:35] Does this allude to the optimization possibilities or really the categories addressed?

I. [00:28:41] Yes, for example on optimization. So, what I was thinking about, for example, are websites like Similar Web. You might know that. You can pull out various information regarding SEO/SEA, etc. Would that be something in this direction?

IP2 [00:29:13] Hm, yes, so I imagine a heat map, for example, could be very useful. Of course, it's always cool to compare with the competition or with the industry-specific assessment of what makes sense. I think that's always very helpful. Yes, what might such a dashboard look like? I imagine it a bit like Google Ads. Yes, although that might be wrong. I thought that with Google, optimization options are suggested to you for the individual campaigns, and then you can say: Yes, I accept. Of course, that's a bit of a stretch because your tool doesn't directly optimize the website. So, it would be even nicer if you say it is checked once, and somewhere, an optimization opportunity is identified, which you can then optimize directly. Yeah, I have to say I don't have a very clear idea right now. I imagine such a heatmap to be cool. A dashboard that shows all the individual values, not just visually, but perhaps also the individual sensory values, which is helpful for a deeper analysis so that you can see where you are and how good you are. That is also interesting for your own internal comparison. Is it the home page, which is already very well optimized, and then you are on the product page and look at, for example, which areas of the multisensory communication are possibly worse rated. With that, you could check your website from an internal perspective. Or you look at the "customer journey" in such a way that it fits together, that not only the individual areas are shown, but that you also make sure that it is authentic. So, it's a whole new term now. By that, I mean that it all fits together. Yeah, so I don't have a perfect representation of the tool that I would prefer, unfortunately.

I. [00:31:20] Ok, thank you. That's why we're talking about it, and I will talk about how the project will develop even further right after the official talk. Basically, it is just query specifics that such a tool would have to fulfill. From your point of view, if you don't have any at first, then that's perfectly fine. And I want to conclude actually briefly on one aspect. That is also the last question. You mentioned comparability to the competition once. So how

important would that be to you - do you already do this in general? This doesn't necessarily have to be on the topic of sensory communication but rather a general comparison of online marketing measures in relation to the website.

IP2 [00:32:21] Yes, so starting at the back. Yeah, we do that a lot. On the one hand, of course, it's about prices, which are very important. But, of course, we also look at the process - and we're not talking about sales now, but about purchasing, because we also buy equipment from private individuals, and there, too, we want to make the process as simple, transparent, authentic, and trust-building as possible. Because people send us devices without having anything in their hands. Of course, the word is that we check it reasonably and either pay out the money or send the device back if you don't agree with a counteroffer. And, of course, we regularly look at how our competitors' purchasing processes are designed and whether we can optimize them ourselves. And that's why I think it depends on the industry and how important the competition is. But I wouldn't consider it just a "nice-to-have" to be able to see the comparison. It depends, of course, on what the tool is ultimately capable of and whether the analysis is done automatically for all competitors or for some competitors. Then, if there is a customer who wants to have this measurement, they can compare.

I. [00:33:45] Ah yes, then we're already done in that respect. Is there anything that we've forgotten? From your point of view, is there anything that you would like to get rid of that just spontaneously comes to your mind, that we should still go into, or that we have forgotten?

IP2 [00:34:08] I can't think of anything right now, except that I find the topic very exciting, of course, and I'm interested in what kind of product it will be in the end or what the development status is then.

As a final conclusion, I can say that I believe that whether such a tool will ultimately be successful and useful really depends on how many specifics it considers. So, whether it considers the competition, whether it enables the comparability of the different pages, whether the tool recognizes which page you are on. By that, I mean that you might be able to set storytelling and inspiration for the page you're looking at, and that will be evaluated differently than the pure product page. For example, how many individual gradations can be made in the tool? I think that's what makes it complicated and probably exciting but always difficult to implement.

I. [00:35:15] So, in conclusion, would you say that multisensory is currently more of a problem? And would you say it's a problem if, if you don't think about it and you can't evaluate it and compare it using a tool like this - is that a problem for you right now?

IP2 [00:35:47] I think that it's not really a problem at the moment, but it will become one in the future, and then the competition will be decided about that in the future. Because it is always a test of strength and further development of the technological possibilities in the online domain. In the past, it might have just been text, then at some point, pictures were added, then videos, then the whole design was crucial, and then an auditory background was added.

So, I think in our online store, it's not a problem currently, but it probably makes a competitive difference in the future. And just as everyone has understood that moving images are important, at least in social media, I think it's

going to go further and further that companies understand that they have to offer something multisensory to the customer and, above all, they have to know exactly where to offer what, because I think it can also be over and not purposeful. Yes, I think it's a very important topic for the future.

I. [00:37:02] Thank you very much for your comments. Really great! At that point, if you have nothing more to add, I thank you for the nice conversation.

- End of Interview -

Appendix 13. Interview IP3 for first SSI

I. [00:00:02] Hello and thank you very much for your willingness to be interviewed. The interview is divided into three blocks: basically, I would like to know something about you, about your work. How long you've been doing it, and what exactly do you do? The second block is then related to online sensory marketing. There, you can also describe your own experiences, etc. The third point is about an evaluation system for sensory online marketing. Good, then let's jump in. So, the first question would basically be: Which employer are you currently working for?

IP3 [00:01:10] Ok, I´m working for an ERP software provider, mainly regarding Microsoft Dynamics NAV, and I've been there since 2018.

I. [00:01:22] That directly slayed the next question. What exactly is your position there?

IP3 [00:01:30] Well, the company is relatively small. I'd say we have 40 employees, and I do it together with a colleague. And we do everything - strategic marketing, writing concepts, campaign management, but then also operational SEO / SEA, website maintenance (we've already done two relaunches in that time). Then blogging, social media marketing, (marketing) analytics, so actually everything that falls into the area of marketing tasks.

I. [00:01:55] Ok, and did you have another employer before that, or is this sort of your first?

IP3 [00:02:02] Before that, I did a dual study program at the Chamber of Industry and Commerce in the field of business administration, in the classic way, and then the online marketing manager course at the Chamber of Industry and Commerce and then the FOM study program directly with the new employer. So, I was there for half a year and then started with that.

I. [00:02:20] wonderful, then that's it about your career insights. That's the most important key data, so what you basically do in the professional field. And the next question relates to marketing and is partly aimed at the day-to-day work. However, you can also describe your own experiences, and some of the questions are also related to that. And the first question would be: How do you personally proceed when you visit a website, for example? By that, I don't mean the previous procedure in the customer journey, i.e., how you get to the website, but your search behavior, for example, or your click behavior on the corresponding e-commerce website.

IP3 [00:03:08] Well, first of all, I have to say that I'm rarely on websites, but rather in apps, shopping on my phone, and then I primarily go through reviews. So, both Amazon, Etsy, Zalando, or something like that. I actually always set a filter on rating and look for five stars or more and then look for pictures, of course. But then also according to something like standards, H&M, for example, has information such as "fits exactly" or "did not fit so exactly." So already a little more accurate reviews of the customers. And exactly then also according to pictures and videos. In the area of fashion, for example, videos like falls the Fabric or also photos, where the fashion should, of course, be well staged and ironed. But then it's also nice, I think when you can zoom in on the photos and recognize surfaces and patterns. At Westwing, for example, I think it's good that the photos show scales by depicting a person next to them, next to the decorative items from Westwing, so that you don't just see the dimensions of the

products but also in comparison to a person who is 1.80m tall, how tall would this clock or similar be? So, in the first instance, I look at reviews, then at pictures, then videos, and in the end, I would say on the text description.

I. [00:04:36] Thank you very much, very interesting aspects that you have mentioned. Then the next question directly following the content that you pay attention to in the online buying process would be the following: Do you think then that consumers (or you specifically in this case) can have a comparable sensory experience when buying online compared to what one just experiences in a store, for example. Are there parallels there? How would you assess this?

IP3 [00:05:06] Well, I don't think it can be compared directly because there is always a scattering loss because you can only use some senses indirectly. You can't - unless you have special devices - smell, taste, or touch if you have this medium laptop, cell phone, or whatever in between. But visually, it is, of course, already possible via photos and videos. Audio is also possible, but I don't know how much acceptance there is. Background music on websites used to be a thing, but I don't think it's used as much today and would be considered as good. But maybe you can still do a lot with description in audio. For example, I know a copywriter who is very good, and she has already written something for a singing bowl provider. And you write something like "quiet and even sounding singing bowls." So maybe you can also describe the audio very well from a product. You can certainly do a lot in the area of haptics, and there's certainly a lot of potential there to show how a piece of fabric falls or how it sounds when you knock on something. For olfactory communication, it is quite difficult. I would never buy fragrances online myself, but I know that Flaconi also has something like filter options for fragrances such as aromatic, floral, fresh, fruity, etc. Yes, and also with Gustation, of course. Another example from this good copywriter: She once did something for a site called "meatless.com" and also described the taste very precisely. For example: "Can you smell the roasted aromas?" or "You can taste this when you let it melt on your tongue with pleasure. I think you can do a lot indirectly, but I still think it's just never the same as offline.

I. [00:06:56] Ok. What do you pay attention to personally from a sensory perspective? Consciously or unconsciously?

IP3 [00:07:04] So consciously, definitely on videos and photos. Or augmented reality like at IKEA. Suppose I can put the piece of furniture in my apartment and unconsciously certainly also on descriptions about tastes or smells. But I think visually, that's always been leading with me.

I. [00:07:27] In your opinion, how important is sensory content in the individual purchasing process, especially compared to "hard facts" such as prices, delivery times, etc.? How would you assess that?

IP3 [00:07:49] Because I work in B2B, I am somewhat influenced by this, and I believe that you also have to distinguish between B2B and B2C. Especially in B2B, it is difficult to get such topics on the agenda from the management. In B2B, I think factors like prices, references, and reasonable offers always outshine everything else because you don't make decisions in the company alone but always with a group of decision-makers. In B2C,

however, I can imagine that sensory experiences lead people to make non-rational decisions. For example, the price is forgotten because a store smells so good offline and has such beautiful music that you are transported into another world and then buy a product that you would not usually buy. So, I think you have to distinguish between B2B and B2C and between offline and online. Sensory communication offline has even more impact than online.

I. [00:08:51] One of my next questions in this context is: How do you pay attention to sensory communication in the online area in your company and in your daily work? Is that already a topic - online sensory communication?

IP3 [00:09:10] The fact that we combine B2B and software makes it difficult. As I just said, other factors are more critical to success here. What we do, however, is that we at least try to present the visuals well. On the website, we use good mock-ups, even if they only point to hardware, which we don't offer, and videos that always show the product in use. We also develop some apps ourselves and try to have an excellent design, for example, with shaded buttons that are reminiscent of machine buttons and perhaps boost the usage time a bit more, and in sales rooms at our company, we try to offer pleasant furniture. And what I would still like to see, but which is not yet on the agenda, if something like soft background music or a pleasant scent or delicious cookies, which can perhaps subconsciously already influence the purchase decision.

I. [00:10:08] So what are the factors online that you're currently looking at if it's just not primarily sensory?

IP3 [00:10:19] So, above all, it's SEO optimization. That's really the most important thing right now because we generate most of the leads simply through SEO, not even through online ads, but really completely through SEO.

I. [00:10:32] Very exciting. That's already reflected in the other conversations as well. The following kind of relates a little bit to the next question: Do you think it makes sense in principle? Let's assume that there was an evaluation tool, which I mentioned at the beginning - if there was something like that, which would make it possible to measure quality in sensory communication online? Of course, also, in your specific case, even if it is software, for example, specified, would that be something that you consider helpful?

IP3 [00:11:25] Absolutely. So, I would bring in all the tools that would allow us to represent ourselves better. After all, we can only ever say what consciously led us to purchase. The processes that take place subconsciously are often much more. And we often can't talk about what really triggered us to buy the iPhone, which is so much more expensive and probably not even better than the other cell phones. Thus, I believe that it can be beneficial and positive for an image if you have a better sensory position and are shown potential for improvement with such a tool.

I. [00:12:04] All right. Then, let's talk a little bit more in detail about this tool. I haven't brought you anything visual in this regard yet because I'd like to talk to you about it in principle first. What requirements would a tool actually have to meet? This first question relates to usability. In other words, how would an assessment tool have to be designed in your view so that it would be practicable for everyday work?

IP3 [00:12:39] Yes, I can think of two possibilities. One is that I use Chrome as a browser on my laptop, and there are these Chrome extensions. I have them, for example, to show me an SEO title. I then use these extensions to see if everything fits. And there, I could imagine that you create a free plug-in for the Chrome Store that is simply embedded on top, and by clicking on the icon directly, some values are output. Some scores, for example, 50 out of 100 in the auditory area or similar. Or - and this is also often the case in marketing - that you simply have a separate page for it with a so-called search slot, as is now also the case with Google. When you enter a URL, you get the report to spit out directly or by e-mail and thereby still breakfast e-mail addresses. So, either as an extension or as a separate page where you enter a URL. So, I could imagine.

I. [00:13:36] Really Interesting, thank you for that. No one has said that about the plug-in yet; it never occurred to me. I mean, that wouldn't be a bad thing. If you think about this report now - besides whether it is via plug-in or external page - what specific information would you welcome that such a report would then have to show? So, more in detail about the quality of sensory marketing?

IP3 [00:13:59] So very roughly, of course. What is already going well and what is not yet going so well. And especially in the case of what is not yet going so well, it would then have to be quite detailed and with many practical examples of how you could do it even better. And if you do it smartly, of course, you are also connected with offers from companies that can help you directly with that. I think it will really help a lot, because companies, as you have already said, are often not yet so familiar with the topic or have dealt with it that they can help themselves. And there is certainly still a great need for people to be trained and to know what to do.

I. [00:14:40] And actually, that's a quick run-through, then that's all the questions I have. So, is there anything that we haven't talked about that you think might still be important for this project toward this assessment tool?

IP3 [00:14:59] It will still occur to me that you could possibly differentiate this into standard and premium. If you now move away from the Chrome extension to this page, then you could also create an area and compare it with historical data that you see in the area we have improved over the months and also have a graph directly to it in a kind of dashboard. Then, for the premium area, you can perhaps create the function to permanently compare yourself with 5 to 10 competitors, just as it is possible with SISTRIX or other SEO tools.

I. [00:15:32] Very exciting. That's actually it already in terms of the questions I brought up. Thank you very much for your participation, your time, and the great answers!

- End of Interview -

Appendix 14. Interview IP4 for first SSI

I. [00:00:11] Hello and welcome. Thank you very much for your willingness to be interviewed. I would like to start by briefly outlining the structure of the interview. I have divided it into three blocks. First, I would like to know what information you can provide 4bout yourself professionally. I am interested in your everyday work. The second block of topics is sensory online marketing from two perspectives. Once seen from their own perspective and once also from the company's perspective. For example, how the topic is viewed from the perspective of their employer. And last but not least, it's about an evaluation tool for sensory marketing in the online sector. I'll come to that later. Okay, if you don't have any questions in advance, I'd like to start directly with the first block of topics about you. What is your background? You've already completed a bachelor's and master's degree in marketing alongside your job, right?

IP4 [00:03:07] Exactly. The bachelor's was in marketing and digital media, and the master's is called marketing & communication. I studied both part-time.

I. [00:03:12] Ah, okay. And can you give a little bit of information about your current job and your career history? Where have you been all over the place? Where are you currently working, and for how long?

IP4 [00:03:31] Yes, with pleasure. I actually started at the same time as my bachelor's degree at my former employer as a working student in the marketing and sales department. That then changed relatively quickly to Marketing and Sales Assistant, simply because the time allowed it, and I could work more than 20 hours in addition to my studies at that time. I actually stayed there until the end of my bachelor's degree. After graduation, I had a relatively short jump to a logistics specialist, so logistics, warehouse, something with pallets, etc. I worked there for four months as an e-commerce and online marketing manager. In the meantime, I had started my master's degree, and that just didn't fit. In the meantime, I'm working for a software developer as a marketing coordinator for the Central European region. We take care of the coordination, implementation, and management of our region here, but we have our headquarters in Sweden. It's also about, let's say, implementing principles locally as well as carrying out our own initiatives, our own marketing measures here, in order to simply make the name known in the market or to bring it to the market.

I. [00:05:32] Very interesting. Do you interface with eCommerce or online business, even in the current role that they are in?

IP4 [00:05:42] Currently on e-commerce a little less. We are an IT service provider for the B2B sector, and we digitize and automate the exchange of business documents such as invoices or order processing from companies to companies or also in relation to government agencies in the online space. But of course, clearly, we are actually only represented online in the sense we have our focus in the digital world. So, of course, we also appear here and there offline at a trade fair or so in the current time, which is also tricky with Corona. But of course, we only focus on online channels.

I. [00:06:28] So by that, you mean your company's website?

IP4 [00:06:31] Exactly. So mainly our website. But in B2B, LinkedIn is also very strong as a network and Xing as well. And yes, otherwise, of course, the popular search engines that we also work on. We also try to do a lot of e-mail marketing. Of course, this is a special thing in Germany and Europe and sometimes involves more hurdles than in other countries. Of course, we always have to make sure that we are on the safe side legally, but exactly, we try to direct the traffic to the website anyway, to do everything via the website. Even when we have events that are posted on LinkedIn, they are still hosted on our website because we can simply use and evaluate the data better there and also handle it with other tools.

I. [00:07:31] Okay. Are you actively involved in designing the online presence on the website? Does that fall within your area of responsibility?

IP4 [00:07:42] Yes, partly. It always depends on the individual case because, of course, some things are given to us by the head office that we have to implement as content. But it is definitely our and my task to localize this content and to adapt it to the market because, of course, specific wordings or topics simply don't fit in our market or have to be positioned differently. We always try to address the local market from our local side and to individually adapt the websites or landing pages that are important for our region or perhaps are special or exclusive for us. These are, of course, entirely in our design and editing sovereignty.

I. [00:08:36] Did you also interface with e-commerce in the previous position or in your other activities? Or, in general, to online marketing, including website building, etc.?

IP4 [00:08:52] Yes, actually, until now, even exclusively. Also, at my other employers, that was always the case. Also, at another IT service provider in a similar industry, in banking communication, it was actually mirrored one-to-one in the same way—so 100% online marketing. And in the transitional position where I worked previously, there was a very strong focus on e-commerce. The business was still very much characterized by the classic old contact forms for B2B order placement, but the online store was developed in the meantime. So that's why I was hired, namely, to drive the online store forward. You can also address B2C customers according to their needs via the online store. Of course, that's difficult because not every consumer needs any storage, boxes, pallet bars, or the like. But that was already the focus: to push the online store more.

I. [00:10:26] Very, very interesting. All right. Again, thank you very much for the information about yourself. So, I would also like to move on to sensory online marketing and ask you a few questions about that. And as I indicated, some of the questions count toward the corporate area, so from the corporate perspective. But some of the questions also count on your own behavior and your own perspective. And the first one would be this. How do you personally proceed when you shop on a website, for example? So, if we look at the customer journey from the moment, you are already on the e-commerce website. How would you describe your search or click behavior?

IP4 [00:12:14] Yeah, so assuming I found the product that I wanted or found the type of products, I would first look at the pictures to see if it just visually matches what I want to have now. On the one hand, the colors or the motif, the pattern, and the fit. Also, a model wearing the product is, of course, always better than, for example, a simple sweater created on the computer and shown on a white background. Having seen that in the first step, I would then look closer at the description or details. Of course, it's useless if the model is 5'6" and I'm 5'9". Then it brings me nothing to buy the same size, for example. But also, information about the product is very important, such as the materials. Because there has been one or the other surprise when the expectation is not met, materials differ significantly, and you should take a close look at what kind of product it is. Then I look at facts such as delivery time, return conditions or the like, to have there of course above all also security. I now have clothing in mind. Especially with clothing, the return rate is also relatively high if you compare it with other industries. That's why I usually pay attention to information such as free returns or the minimum order value for free shipping and return shipping. It can also be sent back and forth easily in case of doubt. And, of course, the payment methods offered. What is available to me? There are still bills, whether it is now simply by PayPal or one must pay. I believe that, nowadays, relatively little has become, at least with consumer goods. In general, the seriousness of the web shop is also very important to me.

I. [00:15:02] Do you think that you as a consumer can have comparable, not necessarily identical, sensory experiences when buying online, as is the case offline, for example, at the point of sale? Do you think that there can be comparability in the sensory experience?

IP4 [00:15:28] Yes, in general. But of course, it's always a matter of trust in the web store from my point of view. So, because you can describe nicely or make nice pictures or maybe even if the product is not nice in actuality. But when you're in the store, then you see it. If, for example, the light is not optimal and the product's color is somehow different.

I. [00:15:52] How would you describe that point precisely in your words? Would that be something like a falsification?

IP4 [00:15:58] Yes, so maybe not a conscious falsification, but it is, under certain circumstances, already a conscious embellishment of the product because then you only want to show the best sides online. So, in the store, of course, the lighting and the positioning are also important. At least you try to present the product in the most beautiful way. Nevertheless, as a customer, you can always take a step back offline and see if the impression remains consistent. This is always difficult online, where you simply have to trust that what you see, read, or hear is realistically true, or at least what I imagine it to be. If I know that it probably won't shine or glitter as well in real life, and I'm aware of that, then that's okay, too. But there can be disappointment, of course. So, I think there are many examples where you've ordered products that just fit completely differently or didn't fit at all or didn't look like they did on the website, and that's something you have less of in the store.

I. [00:17:19] Yes, now you have explicitly mentioned the point of trust, which is also very, very good. What about other factors if we take a concrete example? Let's take the purchase of a piece of clothing, a sweater. Of course, you have many more options in the offline area. For example, you can feel it, which you can't do online. Do you think, if we relate the original question to this case again, that there can still be sensory experiences in the online area that are comparable to the offline experience that you can get in a store?

IP4 [00:18:09] In general, I think yes. However, it might be difficult with products or the kind of products that maybe you've never seen, touched, or perceived in real life. But I think once you've actually touched a comparable product, seen it, smelled it, or something like that, then you can transfer that to the online world more easily because you put yourself in the position. You see or at least read the characteristics of the material, and then you also know that it is comparable to what you may have recently had in your hand. Especially if you can read keywords like soft or rough, heavy or light online in connection with the product shown. So, if you've had that sensory experience in real life, then it's definitely very easy to compare if you can connect those key points or those memories with it. Then you're more likely to say to yourself, Okay, this is actually like this sweater that I saw last week, and this is probably how this will be online, at least according to the description or according to the pictures. So I think so, but from my point of view, you would have to have somehow really experienced it beforehand so that you can then also project that onto it because otherwise, it becomes difficult to really only abstract the sensory experience from your own head.

I. [00:19:34] You just mentioned texts and that you could use certain keywords as sensory triggers. Are there other things you can think of that could create that kind of sensory online experience?

IP4 [00:19:50] Yes, definitely. The images are very important, not only to see the dimensions of a product but generally also in sensory terms. Especially close-ups, when we think about the materials and their quality assessment, to be able to imagine this better. Also, videos that show someone running their hand over the product or something similar so that you can really see it. That's why images and video material are generally very important, because you can then, of course, see it for real. To come back to the point, videos may also lead to fewer falsifications than pictures that may have been edited. Of course, you can also do that with videos, but I think that, nevertheless, the product's look becomes clearer through videos.

I. [00:20:42] Okay. The next question would be as follows, and I think they have already answered it in parts: What sensory components do you personally pay particular attention to when shopping online? You had already mentioned pictures. Can you think of anything else that we haven't mentioned yet? Possibly components that you pay attention to consciously or, above all, unconsciously?

IP4 [00:21:04] What I don't pay attention to is the aspect of the audio content of websites. It actually bothers me more because when I'm shopping online or surfing websites in general, it's rather annoying if there's a breeze or some other audio file that's being played automatically. I consciously don't listen or try to mute the website. What

I perhaps still subconsciously notice is, of course, the thing with the flow of the website. That is the structure of the website, the user interface, and, related to that, the user experience. I think that's something where you only consciously become aware of it when it's really bad. That is, if something doesn't work somewhere or doesn't work now or you think to yourself, okay, where can I pay here now, why do I have to click through five pages and so on.

I. [00:22:21] I see, so those are probably things you expect then, right?

IP4 [00:22:23] Exactly, that's actually a standard by now that a website should actually run smoothly from a user experience perspective.

I. [00:22:42] If we look at the importance of this sensory content, so independently of what we just discussed with the user experience, how would you put sensory content such as images, texts, etc., in relation to hard facts, such as the delivery time, the price or the payment options? How important do you think sensory content is? Is it on the same level as that, or below it, or above it?

IP4 [00:23:22] Yes, I would actually classify the sensory content even above that. When I think through my customer journey now, from my point of view, it's like this, and I proceed according to this that I first really have to be caught by sensory elements in order to get to the others at all. Then I think to myself that if a product convinces me via sensory images, texts, or other things, then I would not be averse to paying shipping fees or similar. That's why I think that has a higher value for me. Simply also from the point of how I click through the website. So, for me personally. If the pictures or texts do not appeal to me, then I am not interested in the delivery time. That can then be as great as possible. That would be relatively indifferent to me. I say times, that's why the content is more important because first the product must convince and then, of course, the framework conditions must also be right, so that I do not order just yet perhaps with another supplier who just delivers faster and delivers a similar product to me. That would be the second consideration.

I. [00:24:35] Okay, in your current company, that is, at your current employer or also at the others before that, is attention already paid to sensory communication, consciously or perhaps also unconsciously, in your daily work? Is that an issue?

IP4 [00:25:04] Yes, that actually splits now because of my previous jobs. In my current job in the IT service industry, I have relatively little connection to it because software is generally also something that is not tangible or not imaginable for people. Accordingly, this also has little value for my current employer in terms of stimulating the imagination. There, one goes instead on the topics SEO / SEA and looks that these things fit all, that the texts are laid out on it then really to convince the consumer of the product. Because, in this case, hard facts such as the price or the scope of the software should be more convincing. But if we now look back at the e-commerce store of the logistics company of my former employer, then it is, of course, important, and we also consciously paid attention to it. So, especially in terms of image content. With texts, I'd say it's a bit difficult, especially if you have a very

large product portfolio and perhaps a few people behind it. Then it's also really difficult to write out every text optimally, especially if the products are very similar. But especially in the area of pictures and the like, we have, of course, consciously attached importance to the fact that people also see what it's all about, what kind of product it is, which is also always supported with measurements or with ratios in the picture and of course we have also described this in detail. But I'd say this is not necessarily the greatest sensory achievement regarding text. To put the product factors in writing, you could certainly do more.

I. [00:27:00] Okay. If we stay with the last example, did you also compare the communication plans of possible competitors there? Is that generally done, that you look at direct competitors/competitors and review how they're doing it?

IP4 [00:27:16] Sure, definitely. Perhaps the focus is not always 100% consciously on how they communicate sensory. But of course, you look at competitors, and I think you also look in part at sensory communication. What do they do differently? What images do they provide? What texts do they provide? What information do they provide? What is important to them? Why, for example, does a product work better for them and not for us? - Even though it is identical. With the products of my old employer, you can really say that. It's more difficult with sweaters and clothing. In general, of course, you look at competitors to see how they implement this.

I. [00:28:00] I find what you say very exciting. If the product itself is absolutely the same, for example, a chair from the Home and interior sector, then the decisive factor in the online channel is how the product is sold. In other words, how it is advertised and with what content. But let's move on to the next question. This is: Do you think it makes sense or is beneficial to evaluate the quality of sensory communication projects in the online sector? So, could you evaluate that and possibly even get the potential for improvement pointed out. Would that be something where you say yes, that would be beneficial, and it would be good if that possibility existed?

IP4 [00:29:03] Yeah, I think that's beneficial. Definitely. Especially for online stores or website owners in general. I think it's just maybe a little bit difficult for the person responsible for the content. So if you don't have any idea about it or you don't know that there is such a tool or a guideline or whatever, I think that you might not put enough emphasis on improving it because the content managers, for example, just don't have it in front of their eyes.

I. [00:29:33] You mean the lack of attention to the topic of sensory communication on the web. That the topic is probably not yet as widespread as it needs to be, right?

IP4 [00:29:49] Yeah, exactly. I think the attention, or the knowledge of the persons, is I think simply in the area not yet or only little available. And that's why I believe that if you have such a, let's say, a simple and straightforward tool, where you say, okay, you work through these ten sensory checkpoints, and then you see results directly. With these results, you can also directly uncover potential for improvement. If this possibility existed, then I believe that it would have added value simply because it would reduce the complexity of the topic for the

responsible persons. You can also see this with many other points in the online store or in the online area in general. There are also many SEO checklists where you say, okay, you have to pay attention to that now. For example, how many headlines, text keywords, etc., you should use and with which terms. Therefore, I also believe that many may not really know, but then such tools also simply refer, and that would definitely bring the people added value. In my view, this evaluation option for sensory communication could also be used the same way as other tools.

I. [00:31:00] Are you currently using tools in your company that have a similar character to optimize websites, optimize SEO, etc.? Do you already use something in this direction?

IP4 [00:31:16] No, not really. So, at least not within the company itself, but we do hire external agencies for SEO and other areas that certainly work with various tools of that nature.

I. [00:31:24] Oh, okay, that's outsourced to you?

IP4 [00:31:26] Exactly. The agencies are taking care of it. So now actively that we say, okay, we look over it once a week or every two weeks and cross off our checklists, we don't do that now in this case. We have an agency that does most of that, or does it in consultation with us, of course.

I. [00:31:50] Very exciting because, in the end, it's always about the addressed target group with such a topic as the introduction or development of such a tool. Who is actually the user now? And you just confirmed that there can also be constellations in which external partners play a role. Perhaps it also depends a bit on the company's size, but it may also be an individual case if you can confirm that. So sometimes you just take an agency, which then possibly also optimizes with such a tool, be it SEO or just perspectively the sensory online marketing, or you just do it yourself, depending on the circumstances, I think.

IP4 [00:32:36] Yeah, so I wouldn't attribute that maybe exclusively to the company's size, but I think it does have a bit of a correlation with that. So, there are smaller companies or medium-sized companies that, I say, benefit more from it in the sense that they would use it more than, I think, large companies do. They might be more likely to outsource. However, they may also have their own in-house specialists. I don't think it's that easy to say in the end, and it will depend on the individual case. But yes, I think it would be a cool thing for the agencies themselves to be able to apply it immediately as a basis in any case.

I. [00:33:40] Okay. Then, I would like to conclude by discussing with you a possible assessment tool for sensory communication quality. How would such an evaluation tool have to be designed from your point of view so that it would be practicable in everyday work? The question is aimed at usability and the flow, as you have just described it. Are there any points that such a tool would have to fulfill?

IP4 [00:34:35] Yes, good. Maybe that's very subjective now, but you can start with that. Although it's a very complex topic, the steps for a good implementation are very simple to explain. People who are perhaps not familiar with this topic can then easily understand which content strategies can be used in this regard. You go into the fact

that 2D images, 3D images, videos, etc., can have an effect, and this is explained in simple steps to someone who is not yet so familiar with it or has dealt with it, and it is made very easy for him to use this tool.

I. [00:35:25] We could sort of say it's the point of simplicity for you in particular. It has to be simple to use, right? What points would there be beyond that on that aspect?

IP4 [00:35:32] Yes, it has to be simple. I think it also has to be fast because of the simplicity. So, you don't want to run an analysis now that takes forever, which is sometimes commonplace in other processes that you spend so long analyzing certain sets of issues. I think the tool should really help to quickly see all action points on the website. Quickly, easily, and, yes, also concretely in the sense that you really know, okay, what do you have to do or what could you do? Of course, you don't have to implement everything. From my point of view, it would make sense to show what the next steps towards optimization are. That one perhaps also subdivides into smaller, simpler, and more difficult projects or implementations. That you say, okay, exchanging the images is perhaps more difficult than switching the buttons from red to yellow. You can at least see in the result what are longer projects or shorter projects because you don't necessarily always have an eye for that.

I. [00:37:00] All right. That's already a lot of important and exciting aspects in terms of usability. My next question regarding the tool is: What specific information would you like to see in a tool about the quality of sensory marketing?

IP4 [00:38:03] So, actually, the main point, as I just mentioned, is to show the potential for improvement of the website after it has been analyzed. In addition, also indicates how long it will take to put those suggestions for improvement into action. How long does it take if I want to improve what the tool suggests? But I think that is also very difficult and very subjective and dependent on industries and companies because maybe one website has ten images and the other 10,000. Then it is, of course, also dependent on that.

I. [00:38:28] I haven't yet mentioned that the tool should, of course, also have the intention of displaying and evaluating the actual situation and based on which the recommendation or the potential for improvement should then be formed. This means that the evaluation of the individual human senses and their score with regard to communication would first be displayed. The score could then lie somewhere between zero and one in each case, and you can see directly how well this is done. Would that be something that you would also consider positive?

IP4 [00:39:20] It depends. Partly, it does, and partly, it doesn't on the grounds that it might be difficult for users to decide which points would have to be fulfilled and which would not only be. If you then see the individual aspects per sense, you might think that you would have to fulfill them somehow because they are there. They are shown. But then you might have to say, okay, for this industry, audio or taste plays no role at all.

I. [00:39:40] So you would still like to see weighting?

IP4 [00:39:43] Exactly, that a weighting per industry or similar, that one perhaps sets a certain focus in advance or certain weightings, so that one also knows what is relevant for me now or at least the most relevant. I don't think for every industry, the complete scale or the complete parameters are really important.

I. [00:40:12] Sure. In the tech industry, smelling is probably less important as a trigger, for example. So, I definitely take the weighting issue with one in terms of the industry or the context.

IP4 [00:40:30] Exactly. It would be good to weigh according to industry. That certain aspects are weighted differently or perhaps taken out completely, if possible and sensible. But precisely that, one also really sees where the focus is for me as a company and what I have to adjust to as a company at all. For example, you have to describe how the product smells or not.

I. [00:40:57] Okay. We also come to the last question, which is: In your view, are there any other criteria that such a tool would have to fulfill, which we haven't even talked about yet? Would it also make sense from your point of view to include a comparability to other websites? That is, also to the direct competition, your competitors?

IP4 [00:41:19] Yes, generally, I think that would be good. Of course, you always want to see how your competitors are positioned and whether you are better than them regarding their status. But yes, of course, it's always difficult because maybe they are completely severely positioned. It doesn't do you any good if you score one point higher on a scale than the other company. Of course, you're better in perspective, but maybe you're still bad at sensory communication. Perhaps it would make sense to have some kind of benchmark, to say, okay, a company of this industry, of this size, should have at least .60 or so on the scale so that it is a good value. You can compare it with absolute values. So, things like page speed or something like that, I think you also don't necessarily compare directly with the competitors, but you need a certain value that is the general standard. I don't think that in such things, at least when it comes to scales, you necessarily look at the competitors but simply want to have a good or solid value that is generally acceptable for the company. So, I don't know if you necessarily compare whether you are .50 points better than the competition, for example.

I. [00:43:09] Would you still include both in the area of comparability? So, a benchmark as a reference and the comparability with certain other companies? Because you have now assessed that it just would not always be helpful.

IP4 [00:43:54] Yes, it is. I would already say that you offer both, especially if you go to the point benchmark. Then, that is also something that is fixed to a certain extent and is not necessarily primarily related to the tool's functionality, but that would be a given. Therefore, it makes sense to integrate the other also, simply to give the users the chance to check, of course. As I said, I also think that users/companies will do this and look up their top 5 competitors there. Of course, it was not meant that companies would not look up how other companies are positioned sensorially in the tool. But, of course, this should be put into perspective with a benchmark somewhere. But of course, you look at the competition. So, I think most companies regularly do competitive analyses, be it in

terms of specific products or keywords or whatever. Every company does that, and that's why it definitely makes sense to include a competitive analysis in the tool.

I. [00:45:13] Wonderful. Okay, so that brings us to the end of the interview. Is there anything else that comes to mind off the top of your head?

IP4 [00:45:15] I don't think so. I have actually said everything.

I. [00:45:15] Then, thank you very much for the intensive exchange, the detailed answers, and your time.

- End of Interview -

Appendix 15. Interview IP5 for first SSI

I. [00:00:03] Hello, and thank you very much for your willingness to be interviewed. I look forward to talking to you. As already announced, it's about sensory marketing in the online space. The goal of the dissertation is that, in the end, we have the possibility to make an automatic evaluation of a website in terms of sensory communication quality. And that's why the interview is designed in three blocks. First of all, I would be very interested in what you yourself do for a living. So naturally, my selection of experts also focused on online marketing managers and content creators, i.e., people who can basically provide information on how work is currently being done in these areas. This is also the aim of the second, smaller block of topics, namely sensory online marketing. This is also very much about your own style and your perception. But also whether you are already working with sensory technology. And then finally, I would like to talk to you about a possible evaluation system for sensory technology in the online sector. That's basically the plan. Then, I would also like to jump right into the topic, and the first question would be: What do you currently do for a living? What do you do full-time and what do you do at elevaty, so to speak?

IP5 [00:02:04] Okay, I'll give you a brief explanation. I first trained as a media designer and then worked in an advertising agency. During the Corona pandemic, which was very turbulent for me, I changed employers and joined a textile. The company used to be based in Düsseldorf, but now it's based in Hilden, and I'm the art director there.

I. [00:02:33] Does your employer happen to produce sportswear?

IP5 [00:02:35] No, we have about three big blocks. One is Fashion. So, in the fashion industry, we do so incidentally, so such basics are a bit more modern and adapted to the zeitgeist. Then we do merchandise for German rappers, for example, to name one name. But the cash cow of us, what we actually focus on, comes as a bit of a surprise now but is actually couple fashion. That's basically the Merci chocolate in the textile sector. So, we also sell emotions, so to speak, and we sell sets of two for him and for her, for example, whether it's the "Best Friends" motif or something for couples, but each with a large print on it.

I. [00:03:32] Oh, okay, there's also always a lot of pictures on social media with text on the garments like "Queen & King," is that it?

IP5 [00:03:38] Right, yes, it is actually.

I. [00:03:39] And how long have you been employed in general and in each of the companies?

IP5 [00:03:49] I started my training in 2016. Then, I did that until the beginning of 2019 or so. Then I worked in the advertising agency for another year, and then I moved to Yarn Studios exactly in the middle of 2020.

I. [00:04:11] What are your daily tasks? And I know we haven't even talked about elevaty yet. That's in addition to you. So, you've probably been with elevaty since it was founded at the beginning of last year, right?

IP5 [00:04:29] Exactly since the foundation. And I'm responsible for the creative part. But first briefly to the textile industry, to Yarn Studios. There, I'm responsible, among other things, for an online store, so the design of the online store, whether it's banners or also the planning for the photo shoots, for the photos that then come into the online store, but also for social media and yes, generally also email marketing, etc.

I. [00:04:58] Great, very exciting. Then, you are exactly the right person to talk to. Fantastic! Because that's exactly what it's all about. What exactly do you do at elevaty?

IP5 [00:05:08] There, it's basically the same, so it depends on which client we're serving. We recently had an order for an architect's office. We did the website for them. But otherwise, of course, we also look after many car dealerships, for example. And there, we do social media marketing. That means creating visuals and videos, etc., or post-processing, i.e., content creation.

I. [00:05:35] Okay, very good. And to that extent to you for now, unless you have anything else you want to add?

IP5 [00:05:42] Mhh, let me think. Actually, no, if you don't have any questions, that would be it for me.

I. [00:06:00] Maybe just about your academic background. You've already finished your studies?

IP5 [00:06:10] No, not quite yet. I'm in my last semester right now, just before my bachelor thesis.

I. [00:06:31] Alright, then I would also like to move on to the next topic block, which is sensory online marketing. The first question in this regard would be: How do you shop on a preferred website now? So, what is your customer journey like? This refers to the part when you are already on the website (SEO and the like would, therefore, be excluded, as it is rather the search behavior/click behavior on the website that is in question). What do you pay attention to when you are on a website?

IP5 [00:07:05] I think you have to differentiate a little bit with which intention I visit the page. Is it now? If I look around, then probably first of all to the home page, and there I look at how the page is structured. Are there any particular categories given? But if I'm specifically looking for something, then I'll probably go straight into the category via the search. Now, for example, if I'm looking for a men's transitional jacket on Zalando, then I'm not going to look left and right beforehand. Then you have to differentiate a little bit which intention is behind it.

I. [00:07:43] And do you like to be inspired sometimes, or do you always go to a website specifically?

IP5 [00:07:52] Yes, well, I do get inspired. I think in this day and age where online businesses are mirroring brick-and-mortar retail and bringing it into the digital world, it's relatively refreshing to be inspired there as well. In other words, to perceive the customer journey in a similar way to the analog world.

I. [00:08:14] That also brings me directly to the second question: Do you believe that consumers can have comparable, i.e., not necessarily identical, sensory experiences when buying online compared to offline?

IP5 [00:08:32] If I now focus on the fashion industry, then it is, of course, difficult at first because it stands and falls with the haptics. And as we all know, this is difficult or even impossible to achieve or stimulate directly via the digital space. That's why it's difficult. Of course, pictures or videos can give the impression of what kind of haptics I can expect. Free returns (for example) naturally remove a barrier to ordering something to try it on or feel it and then possibly send it back. Leaving aside the environmental aspect. Similar, but not identical. It is difficult to classify how similar it is. But yes.

I. [00:09:32] I take it from your answer that you already say sensory experiences per se are possible, but to what degree would have to be determined by the individual case. So you're not saying, conversely, that sensory experiences per se are not possible, are you?

IP5 [00:09:48] Yes, That's right.

I. [00:09:49] What sensory components, such as images, videos, or similar, do you personally pay particular attention to when you store online - consciously or unconsciously?

IP5 [00:10:05] Consciously, in any case, of course, first of all, the visual, that's clear. So images. Then, in the second step, I would even go to videos. So if I'm in the online store, then definitely images first, then videos and acoustic, so auditory definitely put in the back.

I. [00:10:31] And why just the acoustics last from your perspective?

IP5 [00:10:36] Because we don't just surf from home now. The sound is not always directly on and often in various situations. For example, if we're sitting on the train and we don't have headphones on, we don't want to be sonicated on the website if we don't expect it. So when I'm watching YouTube, it's clear that the sound is there. But if I come to a website and there's a big header video where the sound goes right on, then that can also be off-putting. That's why you should take that with a grain of salt, or I take that with a grain of salt, especially in the design, but also from the consumer's point of view.

I. [00:11:16] Yes, and do you then also personally use somewhat more modern sensory experiences/possibilities, such as augmented reality? Briefly consider if you can, for example, a smartphone or even a virtual sweater over your own worn.

IP5 [00:11:42] No, I would definitely use something like that, but I haven't used it in that form yet. The experience I've had with it so far is from my time at the advertising agency. We used augmented reality, not in relation to clothes, but for a construction company that was building something, a large building, and they used augmented reality on the construction fence. You could see how it could look or how it would look. I haven't used it specifically for the fashion industry yet, and I haven't even created it or worked with it.

I. [00:12:18] How would you classify this then? Do you think AR is better or more important than, for example, images?

IP5 [00:12:28] I don't think we're there yet at this time. It would be a supplement. I don't think it can replace images. For a fitting, of course, in the future or even now, it's super good to have something like that. When I turn on the camera, I can then see how the garment falls, especially in terms of quality. For example, a heavy sweater falls differently than a T-shirt. That would be very interesting because it would also reduce the number of returns. Exactly, and partly from the user's point of view, it is, of course, super progressive.

I. [00:13:16] All right. So, how important do you think sensory experiences are compared to hard facts, such as price and delivery time? How would you rank there in terms of value or priorities and sensory experiences versus those other aspects?

IP5 [00:13:39] Oh, that's a good question.

I. [00:13:41] As a range "totally unimportant" to "totally important" or more important than hard facts or somewhere in between.

IP5 [00:13:52] I think somewhere in between because we also see in our current consumption that it works without haptic experience. But I think it could improve that significantly. So that's why I wouldn't say it's much more important or that it wouldn't be important at all. It's difficult to categorize.

I. [00:14:15] That sums it up quite well. That's basically the assumption that it's rarely the most important thing, but for users on a website, a sensory design is certainly not absolutely unimportant.

IP5 [00:14:34] It's important that the user experience and the use are still guaranteed in the sense that it is now, if not even, improved. So, it must not become too complicated because otherwise, you also have a lot of bounce rates when things don't work as they should. And yes, that can also scare people away.

I. [00:15:05] Do you have an example of when it gets too complicated or the other way around, when it's comfortable and easy for you?

IP5 [00:15:15] Concrete example: I was actually once on a website for glasses, and there is also augmented reality that you can then try on the glasses. If then, for example, a plug-in is missing or something similar. And then, an error appears. I go there with the intention that I find the glasses beautiful and want to know how they look on my head. Then, the live sample is still extra advertised. I click on it, and then it does not work. Then I'm faster off the page again than I would try it again.

I. [00:15:47] Ah, ok, I see. So, how is the topic of sensing handled in your daily work life at the company where you're employed? Is that a topic that you think about consciously or subconsciously?

IP5 [00:16:19] That definitely feeds into the work. To a large extent, I would say still subconsciously. Especially with regard to representing quality, representing materials, that's, of course, an important factor, but you can't look at it in its entirety or represent it the way you would like to because we are a small, medium-sized company with a relatively large product catalog. A sub-brand of Yarn Studios is, for example, "Hamburger Hänger," which makes the aforementioned couple styles. There are, for example, also many individualized products. You can't show the whole product range, or it would take a lot of work to show how the fabric looks from the inside. Is it brushed, is it French Terry, etc.? It would, of course, still improve the user experience or the sensory. But that's why I would say it definitely plays a role because you try it where you can. But it's just not one hundred percent in focus, I would argue.

I. [00:17:42] What are you currently doing, for example, to make haptics - which will presumably be the most important aspect for you - as tangible as possible?

IP5 [00:17:57] Definitely detailed photos and also moving image content. I would still do the gradations: first, the product image, and then you should have the possibility in the lower section to also look at the model again, how it moves or interacts in a piece of clothing.

I. [00:18:24] Very good, and do you actually also compare the websites - consciously or unconsciously in terms of sensory? So, which display modes do direct competitors use? Is that being compared?

IP5 [00:18:44] Yes, definitely. So, when you see what Zara or Zalando use for innovations or for possibilities to present just haptics, then you definitely compare that. Or when buying online, for example, if the measurements of the model are not given on a website. Then I looked again for the garment on another website. Maybe the measurements are given there so that I can get an idea of roughly what size I need, etc.

I. [00:19:18] Can you relate the same question to elevaty? So now we've already skipped one question, but that was, yes, how important is that in the daily work.

IP5 [00:19:34] Actually, less so with elevaty because we don't have this transfer performance between a haptic good and the digital world. We focus purely on the digital world. It's actually difficult for me to give a concrete answer because it always depends on the customer that we serve.

I. [00:20:04] Ah, ok. In terms of an agency, of course, it depends on what order you get. That's why your employer is certainly more relevant because you have your own store here.

IP5 [00:20:18] Exactly. Exactly.

I. [00:20:20] Great, then we come to one of the core questions: Do you think it would be useful and advantageous to have a tool that would give you the opportunity to have the quality of the sensory communication on your website evaluated? You would get a kind of score and at the same time also be shown potential for improvement. Would that be something where you would say, if that existed, "Yes, I would find that useful, and I might even use it"?

IP5 [00:20:54] Definitely. So, if you take this further, I don't know now if this is also a consideration of yours, but you could divide the sensory. So haptic, visual, and auditory. It would, of course, be super interesting to find out what appeals to the consumer or what motivates the consumer to make a purchase. Does he need multiple sensory triggers to trigger the purchase? What does he need? And what is the best way to play with the customer in this regard?

I. [00:21:31] Yes, wonderful. So basically, this tool doesn't exist yet, but that's now the avowed goal. Do you already work with performance tools in your area that do not necessarily help you in the area of sensory technology but perhaps in other areas?

IP5 [00:21:59] So we use, of course, the classic Google AdWords. Google Analytics, but also Uribi. Suppose that means anything to you. We have now recently introduced Conversational Commerce, so "Charles" is a WhatsApp interface for Conversational Commerce. There, you can also track how many people have signed up for the WhatsApp newsletter or use customer service. Ultimately, you have to pick up the customer where his friends are, where he is every day. That makes a lot of things easier. A very exciting topic indeed.

I. [00:23:01] If you already have this experience from the other tools, and we come back to a possible assessment tool in the area of sensory communication, then the next question would be: How does the assessment tool have to be designed from your point of view so that it is practicable for your everyday work? And the question is aimed at usability/design.

IP5 [00:23:31] Definitely interactive. Also important, so for me personally, in my day-to-day work, would be the interface to Shopify. A lot of people are still working on Shopware. We recently moved to Shopify with our biggest store. That's why it would be very important, so that not only I but also, for example, the customer service could work with it or so that other people can also see or have access to it. Exactly, especially with regard to a customer complaint, for example, it would be interesting to find out what triggered it. So, was it bad pictures? Was the website "too loud"? If I integrate videos there, for example. So, it would also be interesting to know which sensors triggered a complaint or the purchase in the other case.

I. [00:24:34] But they don't have a basic look in mind right now that they could describe how the online tool would have to be structured so that they can quickly capture all the things that you want to know.

IP5 [00:24:50] As an example, I could give you Charles on this. I think that's very well done. The URL is. Hello-charles.com. Yeah, that's just what I mean by intuitive. A lot of things work drag and drop if you need that. Very clear, very reduced.

I. [00:25:19] Perfect.

IP5 [00:25:21] I hope that answers your question.

I. [00:25:23] Yes, definitely, very good. Those are also points that have not been mentioned yet. The next question is, what specific information about the quality of the sensory response would you expect then?

IP5 [00:25:48] I had already touched on this earlier. So, which senses were addressed the most or need to be addressed in order to achieve a conversion, or which senses are perhaps also disruptive? For example, I now have an A/B test in mind. We have an image on the homepage as a header for a week. That works better than video content with music in the background. You can then see that auditorily our customers are not as responsive as purely visually. It would also be important to be able to see how strong the individual senses are or how relevant the individual senses are on the website or are for the customer.

I. [00:26:41] Very exciting, thank you very much. The actually also already last question: Are there, from your point of view, any other criteria that such an evaluation tool would have to fulfill and that we have not yet mentioned? So, what then also comes to my mind would be: What would you say if one would also initiate direct comparability to other websites? Would that be something?

IP5 [00:26:58] That would be an option, for example, that you see, maybe specifically, this content from the other website works so and so much better on and the senses compared to my content. For example, let it be product photos or product videos. That's what would be interesting. I don't know now if we can also digress from the online store to social media. Here, it would be interesting to see how the ads perform. So, for example, how does the music work? I now have specifically an Instagram Story in mind. The questions here could be: what kind of music and what kind of visual is relevant for my target group on the platform, for example?

I. [00:27:56] Yeah, so we've already tested it using newsletters. You definitely helped me a lot with your answers. Can you spontaneously think of something else you would like to say, something we haven't mentioned yet?

IP5 [00:28:25] No, actually, no.

I. [00:28:30] All right, well, thank you very much for your time and the answers, and have a pleasant day.

- End of Interview -

Appendix 16. Interview IP6 for first SSI

I. [00:00:02] Hello, thank you very much for your time. The first block of questions is about yourself. Could you tell me a little bit about yourself, your professional career, and your agency?

IP6 [00:00:07] Exactly. I would put that in context. We have basically divided ourselves with our original co-founders into three business areas or areas of responsibility, where I basically take care of project management and strategies. That can be for the web, for social, that can be for employer branding, but also for workshops, etc. My colleagues take care of everything that concerns the creative area, that is, all-around designs, web, corporate, etc. And our third co-founder is responsible for everything to do with performance. That means that when it comes to sensory marketing, I'm more there to assess the whole thing strategically - i.e., it's about the questions: Which channels do we use? Which target groups do we have? How do we set up the strategies for this? The other colleagues then deal with the design-related, visual implementation or with the key figures behind it in order to measure the marketing success in terms of performance, both on social as well as on the web or in search or wherever you are acting to monitor this. That's just a bit of background to us.

I. [00:01:32] Okay, but it's basically not an obstacle. So, the questions are actually quite general and go partly in the direction of their own user behavior. Maybe you can go into it very briefly. What are you still doing at the moment? You said that you are not yet 100 percent involved in your digital media agency, i.e., in the form of self-employment. You are still employed at the moment. What exactly do you do there?

IP6 [00:02:01] I am currently still an Online Marketing Manager at an MDAX company. We are one of the largest energy players in Europe, both in power generation and in energy trading. This means that we also play an extremely important role in the current situation surrounding the crisis with Ukraine because we are involved (in brackets now "were") in the Nord Stream 2 project, for example. We will offer the LNG terminals in Wilhelmshaven as a solution if necessary, and we also have major long-term contracts with Gazprom and other gas partners in the course of gas and oil trading, and above all in gas imports, keyword Nord Stream 1, which is so relevant right now. That's where I work in online marketing. About 50 percent of my activities are limited to social media training. That means I do management coaching and communications coaching, and help managers in particular, but also the entire workforce, to become brand ambassadors, the face of the company, with the aim of communicating corporate messages authentically to the outside world. The other areas are more strategic in origin. That means I look after our strategic social media positioning and a wide range of communication measures and campaigns, primarily together with agencies and internally with my team. At the moment, of course, we have a lot of crisis communication, which means we have press releases and a lot of interviews about crisis communication, and these are the topics that move us the most.

I. [00:03:53] Ah yes, okay, interesting, very good. Then, I would also like to jump right into the two blocks. It's once the sensory marketing and then finally also the evaluation of that, so the actual tool. And if you start with the first block, my first question to you would be, how do you go about it yourself when you're in the e-commerce space looking for a product? So, what is your customer journey? However, related to the website. So, what is your search behavior, the click behavior on the website? If you can describe it in your own words.

IP6 [00:04:41] Well, I'm actually very predetermined in my e-commerce behavior. I usually go to an online store with a conscious buying behavior. And I've also usually already made preliminary decisions about which online stores I'm going to buy from. For fashion, I have a store where I always go. For household goods, electronics, etc. - the usual stuff you get from Amazon - my Amazon Choice. When I buy books, I go directly to Thalia. In other words, for every consumer example, or let's say for 90 percent of the consumer goods that I buy online, I already have my store. This step in the customer journey from Google Search, or that I'm somehow susceptible to ads, usually falls away a lot for me. I would say less than with others. That means I go directly to the online stores with a strong intention.

I. [00:05:58] But then, when you're on one of your preferred sites, what information do you need or find most interesting? How do you sort of behave when you're on your preferred page? Now, let's take your fashion example. You're on a clothing site, but you're still looking for new clothes, for example. What do you pay attention to? What is important to you?

IP6 [00:06:31] Exactly. So, you have to differentiate on the one hand whether I have a specific product directly in mind. That would be easier with Amazon because then I would say, "Hey, I need a new pair of kitchen scissors," or I need a notebook, then I would type that directly into the search function. With clothing, I think the approach is a little bit differentiated because I might need a new shirt, or I might need some socks. Then I would rather search via the category functions and especially use filters there because I actually rather basically have a product category in mind. Less a specific product because I say, "I need socks, and I'll just see what they might have on offer." I have to filter, maybe by colors, quality, sizes, price, maybe delivery time, or something like that. This is not usually a problem with clothing, but with Amazon or other platforms, these are relevant keywords. That means that I would actually use filters and the search function more.

I. [00:07:34] Okay, well, I would also want to go directly to the second question, which is, do you think that consumers can have comparable sensory experiences when buying online compared to offline? So again, we can happily relate this question to the fashion industry. If you can feel the sweater in your store now, do you think that there can be such sensory experiences on the web as well? So, is there the possibility of having comparable experiences online?

IP6 [00:08:08] So experience on the same scale, of course not. That's, of course, also a bit of a dilemma where, of course, brick-and-mortar retail will still have advantages, even in the future. But there are many tools and mechanisms to get close to it. I mean, you can't work with smells, for example. You just mentioned that it's also hard to touch products. But, of course, you can work a lot with tones, jingles, or sounds to convey certain emotions or senses. That's perhaps a bit more difficult in the clothing segment. Maybe that fits better with technical things or maybe with an iPhone or something like that, that you do a little bit about it. That works, of course. I can also imagine that there are exciting possibilities for transporting these emotions in the future in formats such as live commerce via social media, for example, in order to simply convey emotions with this proximity, these more intuitive purchases. I think topics like augmented reality or also what many platforms like Snapchat, for example, offer, where many fashion brands cooperate, can be an option. I see the point. But I personally haven't had much interaction with it. And another area that you might mention is colors in particular. Not only the colors of the products but also basically customized landing pages or micro-pages for the products themselves. Say if you now want to radiate certain warmth via the color red, the sweater is perhaps not red at all for the winter, and you could play with red via color accents on the page to bring over certain feelings of warmth or fluffiness in a certain way. Plus, if you're already talking about colors and design elements, then also close-up photos and product videos, where you zoom in really close. You might also know it from cars. You can now shoot cars in 3D. Similar things will probably happen in the future in the fashion industry. You'll be able to zoom into products and see the finest fibers and pigments down to the smallest detail. That's close to the whole thing, but as I mentioned, it's still a bit further away from how it's tangible in brick-and-mortar retail.

I. [00:10:50] What sensory components do you place particular emphasis on, consciously or unconsciously, in your own shopping experience?

IP6 [00:10:59] Hm. That's a good question, so I think also, in terms of our background, UX design and overall experience are important. That's not a specific component that I say, okay, I'm paying attention to the color now or the tone or something. But for me, it's very important that I have a good experience as a user, both on the website and in general in the customer journey. I know, okay, I've been picked up well, and the conversion, someone has thought about that, because as a marketer, you always question yourself in that respect, and then I also feel better to buy where I think okay, they've done that really well. Sometimes, I buy out of sympathy because the store is well-presented. Otherwise, I have to say that my own e-commerce consumption is extremely low. So, I can't really say exactly what I pay attention to. As I said, I buy things from Amazon when I specifically need something. I do the same with Thalia. And I have my own fashion online store, and I don't buy much else from e-commerce.

I. [00:12:08] Would you say then that images and texts are also something that you place particular emphasis on? - product-related, of course.

IP6 [00:12:20] Well, I have to say that my customer journey when I buy something online is extremely short. I decide super quickly, and I rarely save products, reconsider, or come back again and then read through reviews and texts. So, I personally don't put that much emphasis on it. But it's actually definitely a factor, but not for me personally. Pictures are definitely important to me. Texts less so.

I. [00:12:46] Yes, very interesting. And how important do you think sensory content is in general in the buying process online compared to, for example, hard facts like price, delivery time, and so on?

IP6 [00:13:01] I think that is extremely important. Of course, in the last few years and, in some cases, decades, we have experienced a very strong shift from traditional brick-and-mortar retail to the digital world. I also look after customers in the social sector, in particular, where the visual is important, especially on platforms like Instagram or even TikTok, where the sensory overload is much, much greater. We had just mentioned social commerce or live commerce. Here, of course, sensory communication is extremely relevant. In the e-commerce store, too. But I can imagine that, especially in social media, which lives very, very much from storytelling, from images, and also much more strongly from emotions, the relevance will become much stronger in the future.

I. [00:13:56] Okay, thank you very much. Then, we'll go directly to the next question. Does your company or your agency already pay attention to sensory marketing in the online area in their daily work? So, is that an issue?

IP6 [00:14:24] From my point of view, sensory communication is an issue in all marketing areas. It starts with the corporate design, that you have identical colors. That's the logo with which you want to transmit emotions to the customer. Perhaps there are also certain call-to-actions. This is generally the whole structure of marketing messages, which lives from emotions and sensory perception. That's why I think it's intrinsically much more important in communication, especially in marketing and especially in the online sector, and I think it's simply intrinsic. If I were to say that we are sitting in our team, planning a campaign or communication measures, and we are explicitly looking at which sensory communication we are using, then I would definitely rule that out. However, I notice that we are increasingly working in this direction, especially in the agency. For example, we are now working with Stada on TikTok. That's a new client of ours, and we're also noticing that topics like sensory communication are much, much more important there. We have short video content, and I think it really thrives on appealing to a lot of senses in a very short time and then also working a lot with sounds. TikTok, for example, thrives on using tones and sounds that are currently in vogue. That means you use that over and over again. You might have videos on a continuous loop, lots of call-to-actions, good branding, and lots of colors. But you also work with humor, which, in a way, also plays off of sensory. Now, it is not optical sensory, but also building up about it, building up emotions in the customer. There are many things that are intrinsically involved. You can also see from experience why things work well and why they might not work. And in a way, sensory marketing is latently involved everywhere. A strategic decision to say, which sensors or which emotions/senses do we want to address specifically? In both areas, both in my company and now in the agency, this is currently not an explicit issue but certainly an intrinsic one.

I. [00:16:29] Then there's almost no need for the second question, whether you also pay attention to the competition concerning sensory marketing. Is there actually strong competition for your employer? That's a very small field, isn't it?

IP6 [00:16:43] Yes, of course, we have a very wide range of products and services. I could certainly go into that for half an hour now. Of course, there are competitors, but especially in energy generation of course. We have a fortunate market in that there is a desperate need for energy. We don't have a monopoly there, but we don't have any problems getting rid of energy at the moment. In other areas, where there are also consulting services for decarbonization or where there are tenders for who is allowed to import hydrogen or who gets subsidies from the US, etc., the market is very complex. It's very complex, but there are already many areas where there is, of course, absolute competition.

I. [00:17:26] Ah, okay. But if you're already saying that sensory online marketing isn't that much of an issue at your company yet, you're probably not comparing competitors' communication plans either, right?

IP6 [00:17:44] So you would have to narrow it down to two things. One is that we are 99% a B2B company. We don't have an online store. We don't have direct contact with end customers. That means that this area at my employer falls away, and the second area is that marketing is less pushed by sales because sales has long-term B2B contacts. The marketing area is more associated with branding, employer branding, image building, corporate communications, and crisis communications. Therefore, the aspects of our marketing are less sales-driven but rather driven by the fact that we want to have young talents, that we want to build the image, that we maintain contacts with the press, etc. That's why it has to be viewed in a somewhat differentiated way. I think, more explicitly, in these areas, sensory communication plays a subordinate role compared to the sales area and perhaps to the B2C area.

I. [00:18:52] Do you think it would make sense in principle, then, if one could evaluate the quality - notwithstanding now also your current employer, perhaps also later for your agency - of the sensory communication on a website and perhaps also be shown potential for improvement? Would that be something you would consider useful?

IP6 [00:19:20] Who could evaluate that? The end customers?

I. [00:19:26] No, that would basically be a B2B tool. I'll say now, if I had a company right now, I would offer that to you. An online rating tool similar to Similarweb or something like that is supposed to be an online rating tool. There, you enter a URL and get, but this time, for the specific area of sensory, an output about the sensory communication quality of the entered URL/website and what potential for improvement there would be in this regard. Suppose you were selling cell phones or sweaters, but for this, the haptics are not yet addressed so well. Then, the tool would show you that and, at the same time, also show potential for improvement. All with a focus on sensory. Would that be something you would consider useful?

IP6 [00:20:28] Maybe a quick question to understand the tool better. First of all, according to which parameters does the tool measure that? And is it only related to websites because you have now addressed URLs?

I. [00:20:42] Yes, so first of all on websites. But you could also relate that to social media and various other channels like newsletters. You can actually subsume everything under that you can. But for now, we would limit it to websites.

IP6 [00:20:57] And what parameters would be used there?

I. [00:20:59] Basically, the five parameters that are there, so the five human senses. How well are each of the senses addressed, but of course, with a corresponding weighting of the industry that you're looking at? So clearly, if you're selling a food product now, then taste is probably more important than haptics. And in an industry like the automotive industry, it's the other way around. Taste doesn't matter there. But to measure the relevant focal points and how well the sensory system works, such an evaluation tool would be conceivable. And as I said, my question is aimed at whether that's something where you would say, "Yes, if that existed, that would be useful. That wouldn't be bad."

IP6 [00:21:52] Definitively. I think it would make sense, assuming, of course, that it works well. And then, of course, the battle is man versus machine. What works better? Are there maybe psychologists or marketing experts who can give you, with one look, one in a minute five concrete recommendations for action, which is maybe faster and more efficient, whereas I don't know an AI or a tool like that based on whatever technology that might work, I don't know. At what point can that be scaled? How good is that actually? In principle, of course, it makes sense to have an assessment tool for sensory communication or to basically set up assessment mechanisms. Whether the tool is the right solution afterward or whether there is perhaps a company, an agency, or a consultancy that focuses on this, I can't judge now.

I. [00:22:48] That's a very good point. I will definitely include that. The following is just about the assessment tool itself. So, we should assume that it's going to be a tool that should theoretically work with AI in the far future. Texts, images, etc., are automatically crawled and analyzed, and then a score is set up, for example, for the haptics area from 0 to 1. How well does that work, or what score did you achieve? What is the basis for the score? What are you doing well? What can be improved? That's roughly how now expressed in a quick way, the tool should look at some point, and the question is: assuming you would use such an assessment tool in your professional practice, how would this assessment tool have to be designed from a usability point of view so that it is really practicable for you? Maybe you can abstract this from other tools you are currently already using. What usability criteria are important to you?

IP6 [00:23:56] So, as I said, a colleague from the agency takes care of performance and tools. I'm not in there enough. But I think the experience that I've had, if you work a lot with tools and also give tools to companies or agencies or partners if they offer too much, that is, maybe too much data is too complex, then it's not used afterward. I can

well imagine that it would perhaps make sense in the implementation to give two output versions. One for people who can perhaps see five scores at a glance in a dashboard so that you can see directly what you can work on, and then a bit in the background for the programmers/web developers, i.e., the people who actually have to implement the findings, so that you perhaps have an even more detailed overview. I believe that it is simply very important in terms of user experience that the data is prepared as easily and user-friendly as possible because otherwise, I believe that such tools will not be used at all in the end.

I. [00:25:09] And what specific information about the quality of sensory communication to such a tool then show you?

IP6 [00:25:18] So, what I was actually just wondering is, yes, I see the tool a bit like a virus tool. You look first at where there are problems and how the score is or where something needs to be done better. The question, of course, starts with where something needs to be done better. And that is super exciting and also brings value afterward. Specifically, what needs to be done better? If you now say, "Okay, the haptics have a score of .20 out of one in total, then of course, it's not good. But if I'm someone now who, maybe even if you're an expert, you can't do much with the information at all because at least I think the haptics are good. But it's then super difficult if you don't get any concrete action steps or recommendations for action there, and I think in the implementation, in the programming, the AI, it's also complicated to generalize this and then spit out automated recommendations for action, whereas maybe the data-driven failure analysis could be simpler.

I. [00:26:21] Yes, ok, I can understand that point. From your point of view, are there any other criteria that such an evaluation tool would have to fulfill? For example, comparability to other competitors, something like that. Is there anything that you would put additional emphasis on if there was such a tool?

IP6 [00:26:48] That's a good point because, with that, you might already be addressing a solution when it comes to making recommendations for action. For example, you can say, "Hey, here you now have a score of .20 on haptics. By the way, here, Zalando. The product page, for example, is super good," and then you simply refer to it. Then, you might not have any concrete recommendations for action, but you have the possibility to suggest best practices through a lot of data in the tool. What I wouldn't find bad either would be concrete video instructions or support that can explain to the users step-by-step how to implement or solve the problem areas.

I. [00:27:34] Very exciting aspects, mentioning these. So, really, thank you very much already for all the input. Those have actually been all my questions. Is there anything that we have forgotten that you can think of now so spontaneously to the whole topic, what you still want to get rid of?

IP6 [00:27:53] Currently, no, I think that I have said everything for now. Spontaneously, I have no further ideas. I hope that my statements will help you.

I. [00:28:00] Absolutely! Especially when it comes to evaluations. I mean, you just interjected something. That is, for example, different dashboards could be given for the respective user, so for example, for the respective developer, online marketing manager, or also the management, for example, that you can then very quickly capture the information. Less in detail. What is the problem, or what can be done better? What is the state of affairs that one goes into it? In the end, it doesn't just have to be a tool for professionals. It could also be a dashboard for the general public, at least in the enterprise. So, it's not meant for the end user now. It's more to give the end customer a good shopping experience also from a sensory perspective. For example, there are also people who attach great importance to the structures and textures of products. If they have to buy products online because they can't touch the product, for example, then it could help in the future if you really show detailed images that show the fabric of the product and possibly even in the form of 3D content, etc. That one can imagine as well as possible how the product might feel. Sensor technology in the online sector is also a lot about thoughts because you can actually only address two senses directly, and of these, the visual sense is about 90%. So, it's definitely an issue. Those were basically my questions. Thank you very much,

- End of Interview -

Appendix 17. Interview IP7 for first SSI

I. [00:00:01] Welcome. Good, then we can start. I have already explained the interview guide to you before we started recording. The first question would be: In which field are you currently working, and what is your background?

IP7 [00:00:16] I am currently in the nutritional supplement industry.

I. [00:00:21] How long have you worked in this field?

IP7 [00:00:35] For pretty much two years now.

I. [00:00:36] Okay, what did you do before that?

IP7 [00:00:39] Before that, I was self-employed with my own digital media agency. At the same time, I also worked as a sales manager at Mercedes. I worked at Mercedes for two and a half years. But I started my own business a little later, and I'm still doing it a little bit on the side. All in all, it's been going on for maybe a little more than three years now.

I. [00:01:12] So, are you still self-employed in addition to your current job, right?

IP7 [00:01:15] Yes, exactly. I have registered a small business, and in addition to my main job, I also support medium-sized companies.

I. [00:01:35] Exciting. For both areas, but for your self-employment and for your current job, can you elaborate on the day-to-day tasks?... So, what exactly do you do there? That you elaborate on that again.

IP7 [00:01:47] Yes. So, I think the best way to describe what I do is really the term Media Bayer. But it's not the classic media buyer that you see in big marketing agencies, where they're talking about tens of hundreds of thousands of euros of budget, and then they look at what channels they put it into. It's more on a micro level with me because I focus on a few scalable platforms. These are the Meta platforms, i.e., Facebook and Instagram, as well as TikTok, which has now been added, and Pinterest. But we're just getting started with that now. Personally, I've only had experience with Facebook and Instagram so far, and my day-to-day activity is the - hopefully profitable - placement of ads within this Facebook or Meta cosmos. Say there's a platform that's there for advertisers that's provided by Facebook. We can manage our budget there, put that into different campaigns, and just target our audience that way. There are also different goals, but our primary goal is profitability, that is, to generate profitable revenue. That's my main job at my current employer in the nutritional supplements industry. That's what I take care of daily. That's also a daily doing, going into these campaigns and looking at the ads. We are in a fast-moving cosmos. That means that ads must be replaced very, very often, and a lot of testing must be done, especially since the iOS 14 update, which is no longer that easy. As advertisers, we no longer receive so many data points from people who use Apple devices and have not agreed to tracking. I think I read yesterday that probably around 85% have not agreed to this, and we have a market share of over 30% of Apple products in Germany. That means that

it's already extremely noticeable. And with my self-employment, I work in the same cosmos. It's Facebook Ads Manager again. That's the name of this platform that we can use as advertisers. There again, I'm basically running the same thing. I have campaigns, and I just have a different target audience. I have ads again. But there it goes so far that I even create these ads with a small videographer team. That means I write a little storyboard and give it to them for approval. After approval, that's a shot. I then adjust that because there are different placements throughout the Facebook cosmos. Everyone knows the Instagram Story; everyone knows the Instagram feed. For that, everything must be adapted, and I'm not looking for new customers like at my current employer, but new employees who then apply for the job.

I. [00:04:50] Okay. Do you also influence the layouts of the advertisements?

IP7 [00:04:57] By layout, do you mean the format or the complete structure?

I. [00:05:00] Actually, the complete structure. The content as well.

IP7 [00:05:05] Yeah, definitely. So, both in my self-employment and with my employer. As a media buyer, I must be able to speak the platform's language. TikTok speaks differently than LinkedIn, and LinkedIn speaks differently than Facebook. And at that moment, as Steve Ogilvy has already said, an ad must not look like an ad but must simply fit natively into the construct of where it is. For example, we are constantly launching new products, about four per month, and I am responsible for briefing these new products to our Creative Hub, which then ultimately implements the advertisements. I just brief them on what they should implement in the first place. Is it a video? Is it just an image? Is it a carousel ad? If so, how should the video be structured? What content do I want to see? The detailed elaboration then comes from the Creative Hub, but always in coordination with me. This means that I have a bit of a scepter in my hand because, in the end, I'm also responsible for ensuring that the ads work or don't work, and accordingly, it's extremely important to understand how the platform behaves, how people talk on it—the same thing with self-employment. I had already said that. There, I write the storyboard for the videos myself. I get it approved, and then the videographers shoot it exactly as I imagined it.

I. [00:06:45] So also including texts, theoretically also image worlds, etc.?

IP7 [00:06:49] In principle, yes. Most of the time, I'm on-site with a client beforehand. They are often tax consultants or law firms. And then I'm also there beforehand, get an impression of what it looks like there, and then I'm usually already brainstorming a bit at home. How could you build up which scene roughly? Of course, I then consult with my videographers again because they have a different perspective than I do. And in the end, you go there with a plan. You also film it roughly, but you also do a lot of "biroll" - that is, you simply walk through the entire office a bit so that you get something inserted in between when someone is speaking. That's what the videographers do, so it looks cool, and you stay tuned, especially with videos.

I. [00:07:38] Yeah, cool. Very exciting. That's what I wanted to ask you directly about yourself as well. Then, I would move on to the topic of sensory online marketing, and I would like to ask you the first question. Namely,

how do you go about shopping on a website yourself? So, talking about the surfing behavior, the clicking behavior on the website, when you put yourself in your own customer journey? However, it is related to when you are already on the website.

IP7 [00:08:18] Yeah, should I keep this generally? So, I think I'll find it easiest if I explain it with an example.

I. [00:08:27] Of course, feel free to describe directly with a specific example.

IP7 [00:08:30] Well, I think that what I'm saying now is most likely true, without any bias in it, because I think I behave like this, and then I don't do it at all. For example, I'm someone who is often on the go at Zalando because I can't think of many other places where I'm on the go except for Amazon. But I'll leave that out for the moment. It's quite true that I move around the site quite a lot in categories. I landed on Zalando, mostly not through an ad. Now and then, of course, I get ads played out, so actually, I get ads from Zalando all the time, get inspired by them, and then maybe end up on the product detail; look at the product, but I don't end up buying it. Very, very rarely. I'm more someone who takes inspiration from it again, maybe even takes a screenshot and then just takes a little time, maybe even on the laptop, where I have a bigger screen, but it also happens on the phone, and then clicks through categories., So, menswear, for example, and then I just look at what's interesting for me right now or what I'm missing in my closet right now. That was hoodies the other day, and then I just go through this category filter. Then, however, I still look after the brands that are interesting to me. I look then in the moment also not so blatant on the price, but rather on the brand. But it's an individual thing. Everyone is a little different. If I have filtered that, it is displayed to me at Zalando so that the most popular is at the top by some algorithm of Zalando, I don't know. Then I really scroll through page by page and put some things in the shopping cart, even without a hundred percent purchase intention. I put them in there again, only to revise them later. And so I move from category to category. In the end, I have a huge shopping cart, see the cart value, and then I'm also again a little bit to select which clothes it really has to be in the end and what is perhaps rather nice to have.

I. [00:10:43] I feel the same way. I do the same, but then you're more likely to be inspired, I guess, and you're already purposefully going into the category.

IP7 [00:10:53] Completely, totally, exactly. It also always helps me to see a picture of the product in use. With fashion, it's just then dressed. But then what I often do, Zalando also has, but also other platforms, to show these outfits. Did I find in the past somehow not so cool? I like to dress nice, but I sometimes lack the inspiration for the outfit. And there it helps me then actually to see the outfit sometimes. And then I buy this, maybe not one to one after, but I get me there the inspiration and then buy me maybe a similar piece of clothing and then put this but this outfit then again. For me, it is important to see the product not only as a small neckline, for example, with a T-shirt, only the upper body, but also really in combination with maybe a denim jacket still over it, together with cool jeans and white sneakers. That helps me for the moment to just visualize. But does not mean that I then buy the white sneakers there too, because maybe there is not the brand then there, then I buy these somewhere else.

I. [00:12:07] Good point, because that brings us to the next question now. Do you think consumers can have comparable sensory experiences when they buy online as they do offline? So, comparable doesn't have to be identical now, but at least similar.

IP7 [00:12:26] When we talk about sensory above all. I don't know why, but I keep having the supermarket in my mind. That would be an example of that, right?

I. [00:12:36] Yes, of course, you can now also order food online. That's possible for everything. Exactly. So, if you also have an example of what you want to relate that to, then I'd love to. In general, however, sensory technology also refers to the fashion industry, for example, when you may not be able to touch the product directly. Here, yes, there are possibly also compensation ideas on how to cope with that. The question is whether you think there can be comparable sensory experiences on the web. What is your opinion on this?

IP7 [00:13:09] I think so. I just read that again the other day. I don't want to give out Fake News now, but I mean, it was Meta with Nike. They went here and made it possible for you to scan your feet and then see how the new Nikes would really look on you, on your own person and not on another person, because that's something else again. The other person might have a different figure or a different skin color, whatever. It doesn't matter. Therefore, I am of the opinion that there are possibilities. Even if they are not always pronounced. I have never used them myself, but I do believe that there is something like that to compare with each other. Can I wear this garment at all? Does something like this look good on me at all? I ask myself these questions very often when I buy products online. That's why I have a return rate of over 50%. Of the things that arrive with me at my place, I send back a good half because I just do not know beforehand how they look on me. That's where I'm really missing something with online shopping. But maybe you could replicate that. The topic of feeling is difficult, I think, but for me personally, it is not so relevant. But that's also, I think, something very personal again because if it says 100% cotton, then I know what it is. Then, I also know approximately how it feels. And I'm not someone who wears silk, then wool, then sheep's wool, and so on. I always wear cotton, and I don't really need to feel that. At least not in this case. With an avocado, for example, it looks different. There, I press again to see if it is ripe. Although I personally don't need this sensory aspect of the description in the fashion industry, this one aspect of the virtual try-on that I mentioned earlier is missing.

I. [00:15:14] Okay. The next question is slightly repetitive to what you've already said, but I'll ask it anyway. So, what sensory components do you pay particular attention to when you're shopping online? I've already noticed that you pay attention to texts and, basically, to visuals. Do you have any other aspects that are important to you?

IP7 [00:15:34] Exactly. So, most of all, on the visuals and on the logo that's on the t-shirt. I don't pay attention to what's in the product description, but then I pay more attention, maybe to how the fit is. Then it says something like, "The model is 1.90m tall, weighs 80 kilos and wears size L". I read through that in any case because there are just from brand to brand, so different size information partly. Or at least that's how it often feels to me. So I pay

attention to that, and I mean, I personally don't have more sensory things left until the time when it arrives, and I can really try it on. And that's it. To be honest, the aspect of smelling doesn't interest me that much. I wash the new clothes anyway after I have bought them. They can smell a bit like chemicals or something else. There I have now not so the pain with. The topic of feeling is also similar to me specifically because I have honestly never sent back a product from fashion because of feeling, so that it feels bad, for example.

I. [00:16:53] All right. But if we think about your employer in the nutritional supplements industry, do they also pay attention to certain content in the area of online sensory communication? So, is that an issue basically, possibly also subconsciously? Especially when you now create the ads for the products, for example?

IP7 [00:17:19] Yes. That's a good point that you raise there. Because we just had this yesterday, we should also like to pay a little bit of attention to this issue of capsule size in the advertisements because there are probably many people who simply have problems swallowing capsules. And we sell capsules almost exclusively. We do have a few products in liquid form, but I'll say 80% are in capsules or tablets, and there are different sizes. For example, our zinc tablet is tiny. Everybody can swallow it. But then we also have a magnesium tablet, which is a real bomb. Or our Omega3 tablet, which is also quite large. Customers have already complained that they can't judge exactly how big or small the tablet is and how easy or difficult it is to swallow. This is definitely an exclusion criterion for our products, which is why, for example, we have launched another Omega product with smaller capsules. Especially for this reason, because this topic is really very present. I'm not really aware of that, but yesterday I also heard from Customer Service, who are, of course, directly involved with the customer. So, the sensory aspect is still totally missing. We haven't put any extensive effort into this yet, except that we want to include this point in one or two ads as a test. But that probably won't really be enough to give people that without problems. Maybe, now that I think about it, we should even show this again on the product detail page and show people a comparison like this: this is the largest capsule, this is the smallest, and the product shown is in the middle, for example. Not such a bad idea.

I. [00:19:22] Exactly. I'm just picturing if you put the different capsules in a fictitious hand to have a scale. Then you would have in it the XXL capsule and the others, and overall, that would give you a better comparison when you put that in your hand virtually. But it's a good point that you brought up with the size estimation because, of course, that's definitely an issue, also in terms of haptic perception. How big is the product, and how does it possibly feel? Is it totally flexible, or is it a really hard capsule, etc.?

IP7 [00:20:02] Yes, or also the questions as to whether our capsules can be untwisted or opened and then mixed with a drink, for example. Now, that may sound strange when you first hear it, but it's not at all. For example, we also sell turmeric, and there is a recipe called golden milk. It is made from turmeric, and you can use turmeric powder for it, and our capsules can be untwisted. But again, nobody knows that because a new customer has never had the product in his hand before. And yes, that's what we're still missing in terms of content.

I. [00:20:41] Okay. In terms of now, though, again, image presentation in general, not necessarily in terms of size, and also textual description. Do you pay attention to sensory communication there as well, so how do you formulate the texts? How do you create the images, and which image worlds do you present and combine with texts?

IP7 [00:21:01] Yes, extremely. So, with us, unfortunately, it's in a very limited context because we are bound by the health claims, and we are basically not allowed to say anything except what the health claim specifies. In the case of zinc, for example, this is the text: "contributes to the maintenance of a normal immune system." This is, of course, a sentence that is not really sensory appealing because it neither triggers any emotions in me nor have I really understand the likely content. Well, on that point, maybe I do. But there are also countless other health claims where you don't really understand what the product is really good for. But we try to convey it through the imagery. We have three brands at my employer, and one of them, for example, has a brand identity in the area of closeness to nature. This one also has a target group of women over 40, roughly. There, we take great care to communicate naturalness because our products also contain 0% additives, which means 100% of the ingredient that is just bought. This is different from many other brands, which do not have any fillers in there. That is not the case with us. This is what we describe or show in our pictures. We also show this natural aspect with colors and nature images and want to emphasize where we come from. We also try to say a little bit through the flower what the product is actually good for, especially in the texts we try to do that. As I said, but we are very, very restricted with everything, especially in the store. Actually everywhere. We only go extra into a gray area with our advertisements because we somehow haven't had quite so much trouble with it until then. But on our website, unfortunately, we have to be extremely careful about it, and we stick to it. We are a little bit limited. Unfortunately.

I. [00:23:08] Do you think it makes sense then, in principle, if you maybe don't focus it now necessarily on dietary supplements or something like that, to evaluate and improve the quality of sensory communication in e-commerce? So, how well do you do that? If you could evaluate that, would you say that's something that you think is useful? Even if, at the same time, you might also be shown potential for improvement. I'm going in the direction of an assessment tool now. If there were something like that, would you welcome it?

IP7 [00:23:41] Could you give me a little bit more detail on that? So maybe ask the question again in different words?

I. [00:23:51] Yes, of course. Basically, it's primarily aimed at website design in e-commerce, but it could also be used to analyze the sensory communication quality of advertisements. You could abstract it to the fact that you could basically use this tool. Let's say it would be similar to an evaluation tool for other e-commerce areas. So, for example, for SEO, the application similarweb.com. Or similar. There are also corresponding tools to look at; how well do you do that? And to build up a similar tool for the area of sensor technology is basically the idea, for example, by putting your advertisement there. And at the end, it is said, now exemplary for the brand you just mentioned, that in the worst case, it transports everything but nature on the possible e-commerce channels, and

that's why it needs improvement from a sensory point of view. Or you use texts that are not related to nature so that this does not match. That is still quite trivial now. But later, of course, it goes into the details, which are a bit more complex. And that is the basic idea of this evaluation tool. Namely to show, also with a kind of score, how good the content is from a sensory point of view and to identify where its strengths and weaknesses might lie. Here, I'm really thinking about your brand. You actually have to pull this off from A to Z so that you actually convey this idea of nature in the imagery, in the textual approach, in everything that goes with it, in order to build up a real world. From a sensory point of view, this world should also encourage viewers of the website or advertisement to imagine, for example, how it smells in nature. Maybe that even contributes to the generally perceived sensory experience being consistent with the brand through the web as well. And depending on how well or not well that works, you could then use this tool to find out.

IP7 [00:26:02] I find that a totally exciting thought because I dealt with that intensively when I started with the whole online marketing. Copyrighting is something I've been looking at, and copyrighting can actually do so much. I just see it so rarely, somehow. So, I know a few really good copyrights that take me into a world where I follow that as well, where I pick that up, and where I feel like I'm having an experience right now, even though I'm just reading. Yet it gives me a feeling. And all of a sudden, I have a feeling, for example, that I just slept through it. I'm just coming to this example because we used to have a copyrighter who, unfortunately, is no longer around but who wrote exactly like this. With these text elements like, for example, "and now imagine...".

I. [00:26:58] Yes, exactly. That's the direction it goes in particular then.

IP7 [00:26:59] Yeah, and he keeps picking me up with that. Then he also goes on to write, "But pay attention, You didn't know that yet..." These are such little tricks and tricks, and after reading this text, I feel picked up. Other building blocks that come to mind are: "Aren't you also tired of having such a hard time getting out of bed in the morning, then sitting at your laptop kind of hungover." With that, he already gets ten YESs from me in the first paragraph, and I'm then totally hyped. And then he has a few words that give me an appropriate feeling. I think that's totally great.

I. [00:27:38] Very good. In a way, this evaluation tool would also be intended precisely for this purpose. If you, of course, also enter a few parameters, for example, in relation to this world, you then also get displayed if certain terms have not yet been used but which I say now are catchy, which you should then pick up. These can then also be incorporated when they are shown by the tool. This is supposed to be a kind of tool. Of course, that doesn't exist yet, but that's the basic idea. Exactly, and the question here would be if there were such a tool, whether you would basically say that this would be something that I would consider useful and also use?

IP7 [00:28:17] So from my perspective, I think it would make sense because the tool would give me a chance to approach our copyrighters without having to go into the texts myself, maybe have a counter-proposal created or tell them what's bad, and there's no time for that. But to go here, to say, to test this once and to say to the

Copyrighter: "Hey, look, the traffic light strikes straight on orange," and the sensory content is perhaps straight only a 5 of 10, or which scale at the end that will be then also in the Tool. Then I can go into the dialog and say: "Let's improve that again." And the person, if he or she then takes what the tool says and what I say for granted, then that would be great, of course. That simply saves time. These optimization loops could then probably also be eliminated or minimized because the copyrighter or content creator could then simply use this tool without me having to check it again. So, I would use that, if I am satisfied with it then, absolutely.

I. [00:29:14] All right. Okay, and what tools are you currently using in your daily business?

IP7 [00:29:19] In terms of?

I. [00:29:21] In general, so related to your work. That's kind of aimed at the next questions, which are actually more about the actual assessment tool for sensory marketing. This is also about the requirements. The concrete question would be: How would the evaluation tool for sensory communication in e-commerce actually have to be designed from your point of view so that it would be practicable in your everyday work? Hence, the previous question about which tools you are currently already using. Perhaps you can abstract from this what you consider to be particularly good and practicable.

IP7 [00:29:58] Yeah, so I just use Facebook's Ads Manager extremely. Then also Google Analytics, Google Data Studio, and, of course, Excel. I think those are the most important ones for now. The rest doesn't matter for now. An evaluation tool would help me, especially when it comes to the fact that I, as a media buyer, am always sitting in front of a vast data jungle. Let's loop back to the beginning of the interview. I brief creatives and then get them created by my creative department. There are a lot of different ones. Maybe they always name another pain point to trigger different target groups. And I then test the creatives. I look at a lot of numbers when I've tried them. They all tell me something but don't tell any designer anything. And we are faced with precisely this problem. How do we make it so that what I see there is transported to the creative department as simply as possible? But in such a way that they still have all the information. And we are currently trying to solve this by committing to a few KPIs. These KPIs must then be defined. They have to be explained. What do they mean now? And then we work there, or at least try to do so now in the first attempt, because we are not yet ready to work with color scales. A rich green means that everything is top. In such a case, we should take a cue from the Creative, for example.

I. [00:31:44] Okay, so something like a traffic light system are you implementing?

IP7 [00:31:44] Yes, exactly, it's a traffic light system. So, something like that, I think, would also help me as a non-copyrighter, maybe with a highlighting of certain elements, where you say that you have to look at it again, especially here, and this is provided with an exclamation mark. And I'll just say that five exclamation points, for example, could lead to the traffic light only being yellow, and even more exclamation points could lead to red. But when I have corrected the individual exclamation points, I notice how the thermometer or the traffic light slowly

turns green. So, it's really a visual thing made for children. I think that helps us in the complex work we do every day.

I. [00:32:28] Kind of like a dashboard, so to speak, you mean?

IP7 [00:32:31] Yes, it does. Yes, that would help.

I. [00:32:35] And if you now think a little bit more in detail about what specific information about sensory communication quality this framework, this assessment tool would have to contain. What information would you consider useful or necessary in it?

IP7 [00:32:52] What would be good would be, first of all, to divide up the sensory aspects according to the senses, that is, to classify them according to seeing, according to feeling, and so on. That the information is categorized. You realize I'm a person who generally likes to think in categories (laughter).

I. [00:33:10] Very good (laughter).

IP7 [00:33:12] So, for me, in my perfect world, the tool has categories that always focus on one aspect of sensory content. And then under that category are maybe subcategories that describe individual aspects again in detail, and then check my text for that, for example. And behind each element that has then not been fulfilled, it should then somehow flare up red so that I can then go directly into the category, into the sub-element, and understand, okay, it's about sensing, for example. Then copyrighting is a sub-item, maybe. And then it says something like the context of the brand story may just not be there and could be improved. In relation to the previous example, it could be said that no viewer feels picked up by the content because it is not nature-related. Then, a hint could appear that it might be necessary to rewrite it. There could be a subheading that indicates whether the sensory effect of the product is explained. What does the product do to you? Because that's all we're really interested in. I'm not interested in the product. With a nasal spray, I'm only interested in getting a clear nose. I'm not interested in the product. And if then something is written like "You open the terrace door and can smell the fresh breeze intensively in the morning" or "You go to bed in the evening with a free nose and don't scare your girlfriend after two minutes with a snore." That makes the general performance totally alive again for me, and that should then be such a subcategory, in my opinion, which then lights up or not.

I. [00:35:00] Okay, from your point of view, are there any other criteria that such a tool would have to fulfill, for example, comparability with other websites or competitors in general?

IP7 [00:35:16] Yeah, that would be cool. Especially to get a little bit of a peek, honestly. So, if I could have the tool crawl not only my own website but also competitors' websites so that it shows me how well they're doing it, that would help me, of course. Simply to have a best practice. For example, if I'm standing at the beginning and everything is red. Then I sit in front of it, and perhaps I would find a best practice very useful as inspiration. So, comparability where you can include other websites, I think maybe not for beta, or maybe already for beta, is very cool. Would definitely use it as well. At least to check it out, even with the closest competitors.

I. [00:36:16] Okay. Finally, from your point of view, have we forgotten anything else? In general, can you think of any spontaneous ideas that a tool like this should contain? Otherwise, that would have been all the questions.

IP7 [00:36:32] Yeah, I'm just thinking about this topic of maybe when you're talking about sensors, maybe you also include audio at some point. I don't know. I'm sure it doesn't even matter in many segments. For example, in our case, you can now hear how someone swallows the capsules. I don't think anyone wants to hear that. In fact, I can't think of anything specific right now. Biting into the apple is nothing great now, either. I don't need an audio experience when I'm getting dressed. We might have to think again about whether there are any areas of application where we can say that we are offering this for these companies or for this segment. Right off the bat, I can't really think of anything. That's it.

I. [00:37:25] Well, that brings us to the end of the interview. Thank you very much for your time and the detailed answers!

- End of Interview -

Appendix 18. Interview IP8 for first SSI

I. [00:00:04] Hello and thank you very much for your willingness to be interviewed. Then we can start directly. Then maybe briefly about your person. So, where do you work, and in which department exactly?

IP8 [00:00:21] I'd be happy to. I work in Düsseldorf for a well-known fashion retailer in the online sector. The department is called Shop Management and Brand Relations. It's our big team, so to speak, and I'm responsible for brand relations with four other colleagues. The whole store management team takes care of everything concerning the online store. All content, all pages that you find in the online store. That's basically what my team does. We, as the Brand Relations team, are responsible for communicating with our suppliers, with the brands, and for planning campaigns for the online store together with them. Whether it's placements on the homepage, placements in the navigation, placements in the individual categories, or even beyond that, we plan campaigns together with other channels, for example, newsletters for social media. Sometimes, it's even 360-degree campaigns, where measures are also carried out at the point of sale if necessary. Exactly. In addition, we started the Live Shopping project last year, and I have been part of the team since the beginning of the year. In principle, we share the team a bit. On the one hand, we are from the e-commerce area, from store management, and then the social team, which then supports us in finding talent or influencers with whom we can implement the live shopping format. It wouldn't work without them. We found that out pretty quickly because they naturally have a certain reach, which we also need. In summary, that would be my field of activity. Oh, and we communicate a great deal with our suppliers, plan the campaigns, and then implement them together. Of course, after the whole process, there is also a report from us, which I also take care of.

I. [00:02:45] Interesting. Do you have any other professional stops in your career so far?

IP8 [00:02:50] Yes, I had some over stops before. So, I was in a consultancy in marketing, among other things. I was at a global cosmetics company, also in content and communications. For a short time, I was also responsible for a startup in the area of content management for LinkedIn, but then I came to my current employer a good year and a half ago. I actually started there as an intern, and then it was basically a smooth transition.

I. [00:03:43] Got it. I know that from my own experience as well.

IP8 [00:03:48] In addition, the whole e-commerce area is growing super fast, now also through Corona and especially in the fashion area. I think we've almost doubled in size within the team from last year to now. So, it's really super exciting to see the direction in which this is developing.

I. [00:04:11] Yes, very, very exciting. Short off topic again about live shopping. Is there any experience there? Is it worthwhile from your point of view? So, since you implemented that, are there observable changes in the KPIs? For example, have the visits risen sharply, or have the sales values?

IP8 [00:04:47] Yeah, what you can definitely say is that it's not used as a sales tool because, in terms of time, it just doesn't relate to the cost. Instead, we use it for images. We are particularly strong in the area of occasions, be it

cocktail evenings, weddings, suits for men, or something like that. That's where we're super strong. But what we lack a bit online is the consulting aspect, which we can offer intensively in the fashion stores. That's why live shopping is super interesting because it allows us to offer some advice online as well. Especially now with Corona, when all the stores were closed, we also started with it. I think the whole thing started last year in April, and it was just an excellent alternative for people who couldn't go to the stores anymore to really get inspired and advised online. We work together with a service provider who basically gives us the tool. This tool also has the option that we can use a chat during the live stream, where we can also interact with the customers. Questions can be asked where we as a company can then answer in the background, but where the person, the influencers, who are in front of the camera, for example, can also respond to questions live and answer them again. Accordingly, live shopping is great for the image and helps us to integrate this consulting aspect a bit online.

I. [00:06:44] Yes, super exciting. I don't think many people are currently doing that, but the concept is interesting and fits directly into the next topic block, which we can continue with. Namely, sensory online marketing. First of all, here's the question of your own consumer behavior. How do you go about it yourself when you store on a website? So, the question refers to the fact that you describe your addictive behavior when you are already on the desired website.

IP8 [00:07:34] So, I would say that there are two options. Either I already know what I want to buy, or I want something specific, like, for example, in the fashion section, a new dress, then I know what I want. Then I go in principle directly into the category dresses and click me through. If necessary, I also already have preferred brands, can then apply a few filters, can choose a certain color, for example, or a specific size, and then I would start directly in the individual categories and click through there. Another option I often use, probably due to my job and the fact that I'm much in the online store, is looking for inspiration. So, I don't just look directly at the products, but also, for example, on the home page, first look at what there are actually just relevant topics or what is currently trending. Then, you automatically pay more attention to the content. Some online stores - and we have also just started - create such "Get the Look" add-ons to be able to see how you can combine certain items of clothing with each other within a look. Basically, it's a good way to get inspired and then take a closer look at the garments and add them to my shopping cart. I think those are the two different ways. Either I already know exactly what I'm looking for and proceed accordingly, or I let myself be inspired first.

I. [00:09:30] Okay, then we can go straight to the next question. Do you think it's possible, in principle, to have comparable, not necessarily identical, but comparable sensory experiences when buying online?

IP8 [00:09:51] Yes and no. So basically, you have to say, in terms of sensory communication, that we really do have more of an opportunity to address all the senses in a stationary setting. So online, the possibility of touching the product is missing. That is completely absent online. Well, especially when it comes to the quality of the material, online, we naturally only have the option of getting the best possible visual experience and, if necessary, also an auditory one with video integration or something. Accordingly, I think there's a huge difference between going to

a department store, looking at a product, trying it on, and seeing how it looks on me. In the online store, I look at the photo and then have to decide, could this be something for me? Sometimes, depending on the photo quality depending on the text info, I may not even know what the material is like and then ask myself, what am I getting myself into? I think you can also do a lot in this respect online, especially with regard to the visual language. Working with videos, as I just mentioned, can also be helpful. That you don't just show the article in a cropped image, but perhaps also photograph a model dressed, or at best even show live in Live Shopping how the item of clothing looks worn on someone else, where I can then even ask how tall the person is. Then I think you can get a lot more out of it than if you just have a basic online store. I'll just call it that, which, in principle, only has a classic picture of the article but no other features.

I. [00:11:54] All right. You've actually anticipated a bit of what the second question involves: What sensory components or design aspects et cetera do you pay particular attention to in the online shopping space?

IP8 [00:12:16] So, as I just said, definitely pictures of the product and also how this looks dressed on a person. In addition, also has good picture quality. In the best case, you should be able to see what kind of material the item has. Of course, this can also be transported via a photo. Then, however, also the aspect text, so product information, be it now to the material, be it perhaps also only the info, which size the model wears in the picture so that I can also better relate that to me, to assess how it might fit me. But maybe also via video content, where I can see the model turning in a circle, for example, to see the product from all sides.

I. [00:13:04] Have you already implemented the latter in your store?

IP8 [00:13:06] That's also a considerable aspect that we're working on right now. We're going to be launching a new online store in Germany in the fall, and it's really going to focus on the imagery, the image quality, and using images of products being worn. I think even about a year ago, we also only had product images that really just showed the item and didn't show how it is worn. If you hover over the product image, you'll also get the other view with an image that shows the garment dressed.

I. [00:13:51] Will that be implemented with the new store?

IP8 [00:13:54] That's currently already the case, but not for so long. And with the new store, the whole thing will be improved again, especially in terms of quality.

I. [00:14:14] All right, then we can go directly to the next question: How important do you think sensory content is in the individual buying process, i.e., offline and online, compared to hard facts such as price, delivery time, etc.?

IP8 [00:14:33] I think it's super important. If you just imagine having an online store where, for example, only the product is shown without a picture, but only with the price and, at most, the material information. If I compare this with an online store that has a super informative picture and gives me all possible details, then this has a super strong influence on the purchase decision. The more info or the more pictorial details I get, the better I can make

a buying decision and, of course, the more attractive the whole thing is. And yes, as I said, this drastic comparison is important here. The one store that has no images probably won't sell as much as the one that has a lot of sensory elements.

I. [00:15:34] Yes, okay. And in your daily work, so speaking now with your employer, is conscious attention paid to sensory communication? Is that an aspect that is taken care of?

IP8 [00:15:53] Under the term sensory, I would say no. Of course, we also have the whole creative team that is responsible for visually designing the whole store, setting highlights, and working on production images in that context. In the meantime, we are also working with a new photo service provider. So, attention is paid to that, especially because we now also have this live shopping format. Perhaps this is just not being consciously implemented in terms of sensory communication.

I. [00:16:42] Well, of course, that's more of a technical term, and you probably use it less outside of university. But indirectly, that's exactly what you just said.

IP8 [00:16:58] Exactly. Yes, indirectly, definitely.

I. [00:17:00] Great. Then, the next question would be, namely, in the direction of a possible tool. Would you think it would be useful in principle? Let's say there was a tool now, which I talked about at the very beginning, which measures the quality of sensory communication, evaluates it, and possibly also shows potential for improvement. Would that be something where you would say, yes, that would be useful, I would consider that good, possibly even use it, if something like that existed?

IP8 [00:17:36] Yes, I think it would make sense because, as you just said, the whole topic of sensory marketing is already being addressed in some way, but it would be good to really have a tool like that, which also tells me that this is good and this is perhaps not yet so good, perhaps someone else is doing it. I think that could then also be helpful to really take more targeted measures. Otherwise, the whole thing always remains a speculation and is based on what the competition is doing. Often, one makes then a competition analysis and orients itself only at what the others make and asks itself whether that would be perhaps also good for one's own web page. But to really have a measurement model and tool like that would definitely make sense.

I. [00:18:24] All right, and are you currently using tools to check certain things in e-commerce?

IP8 [00:18:38] We have a tool called mouseflow. Among other things, you can put head maps over the online store and then look at the click behavior of the website visitors. For example, which teasers, even if we have a campaign page or another content page, were clicked on particularly frequently? Which teasers have a particularly high dwell time with the mouse? How is the scrolling behavior? We can take a look at all of that, and maybe that goes a little bit in the direction of seeing what is well received, what is perhaps not, where people tend to scroll over it. Otherwise, we tend to measure hard KPIs such as bounce rate.

I. [00:19:16] Okay. Yeah, good. Keeping these evaluation tools in mind now, I'd like to quickly ask you the last three questions that relate to the sensory evaluation tool. As of today, that doesn't exist yet, so of course, I'm dependent on your valuable input. The first question on this point would be: How would such an evaluation tool have to be structured from your point of view to be practicable in everyday work? Are there certain things that you can think of spontaneously? If you also think about the other tools, what do they have that sticks in your mind?

IP8 [00:19:42] You meant yes, just that the tool should then be so that you enter the URL and then you get certain aspects displayed, right?

I. [00:19:50] Something like that, but then what would be meant in particular is a detailed evaluation of the sensory communication quality of the website that one has entered.

IP8 [00:20:02] I would say, so it would be important in any case that, of course, it is considered in advance which aspects should be displayed to me. Be it then, for example, that visual aspects are then evaluated, such as the imagery. Then get, analyzed how much image material is integrated into the website and how much video content is integrated. But then maybe not only the quantity but also the quality of it. I think evaluating that objectively is difficult because the topic of sensory is, of course, also an individual perception to a certain extent by the customers. You would probably also have to ask customers how the store is perceived. Otherwise, I find it difficult. Sure, you can measure the quantity, but whether that is meaningful on its own is unlikely, in my view. You can also use a lot of visuals that are absolute nonsense and don't stimulate my senses at all.

I. [00:21:38] I see. The question was really only aimed at the structure of the tool. You've kind of already answered the second question about what sensory content should be. But we can go into that again in a moment. What I actually meant was how the tool should be structured. The way it's currently planned, it would include, as many other systems do, as a core dashboard that would allow you to quickly see the analyzed actual situation in terms of the sensory communication quality of the website. Maybe you have some ideas on how the tool could be structured?

IP8 [00:22:16] Yeah, so basically, I think you probably need a site first where I have an overview of sensory evaluation. Is that currently on the website good or bad? But then I also think it's important to be able to click into detailed pages where you can take a detailed look at what exactly is really good or bad and where there is potential for improvement. I also find this concept of the traffic light system actually good because you can see at first glance that green means super positive. Yellow means that there is still room for improvement, and red probably means what you should work on acutely. Basically, I agree with you.

I. [00:22:59] Okay. Then, let´s jump to the second question. What specific information would you like the tool to display regarding sensory marketing? Is there anything additional to what you said? You had already indicated

that you would find individual subcategories good, and my thought was also in the direction of texts, images, etc., that you are also told or displayed per sense how well you do it and where you could improve.

IP8 [00:23:29] Yes, that's what I would have said now, that you separate visual and auditory content, for example. And then again, especially if you start from visual content, differentiate between image, text, and video. Exactly. So that's how I would suggest it.

I. [00:23:54] Okay. Then we've also come to the last question. From your point of view, are there any other criteria that such an evaluation tool should fulfill in general? I'll say, for example, the comparability with the direct competition. Would that be important from your point of view?

IP8 [00:24:07] Yes, definitely, particularly in the fashion industry. So, we really look a lot at the competitors, especially online; the customer can also compare very, very quickly between the individual stores. If you could see in the tool, in principle at first glance, how my competitors are doing, in the best case, I can then also click into details and see why. What do they do differently? What do they do better? Then, I save, to a certain extent, my own competitive analysis and do not have to evaluate it myself. Generally, I have that in the area of the tool together. That would be really useful in any case. Otherwise, beyond that, just ease of use is important. The dashboard, as I call it now, should be quickly understood by everyone, even if you have not now thought more profoundly about the subject. What kind of results do I get, and what can I do with them?

I. [00:25:23] Yes, well, that was actually basically enough answers. Thank you very much for your time and for the detailed answers.

- End of Interview -

Appendix 19. Interview IP1 for second SSI

I. [00:00:02] So, first of all, thank you very much for your participation and willingness for a second interview. Then, let's start again with what you just said unofficially. Please briefly explain what you focus on in your work, which would interest me again. You also mentioned that you use a lot of Figma. You could briefly explain in which context you use it and your field of activity.

IP1 [00:00:28] As I said, my field of activity is 100% related to the Amazon world, so in the advertising agency where I work. There, we create content, or in the team that I'm in, content for customers who sell products on Amazon. Among other things, the classic B+ content, consisting of the titles and the bullets, where we then ultimately write down the texts and also create the images with graphic artists from our team and then my main business: the creation of so-called brand stores, so websites in the Amazon world, so to speak, websites in a website. And we create these brand stores. We write the texts for them, think about images, and sometimes also get images from customers, which we then insert; what we do in connection with Figma is that we design these brand stores in advance. So, we create the frames and then build the modules that Amazon gives you in those frames. For example, Amazon allows you to put a 3000 by 600-pixel banner at the top of the page. On the other hand, the navigation bar on a website is done entirely by Amazon. This results from the fact that you can use different modules and then say, okay, you now have the homepage on one side, the start page or landing page, and then come to the products and categories - and you can build everything like that. Initially, we thought about how to best reproduce this because we can only upload something if we consult the customer. Accordingly, we then thought about using Figma for this purpose, and then we ultimately built the pages, went through them with the customer, and discussed them. The customer can also add ideas. Wouldn't they rather put the picture in the right place or swap the text with it or something? And that's how we use Figma to implement our content work. Exactly.

I. [00:02:33] Oh, so I really didn't have that on my radar that it existed. I then researched and quickly concluded that it's the most popular web design tool. However, it took me a bit to get familiar with the interface. I wanted to create the mock-up as a click dummy so that you can walk through it a bit and get an idea of its usability. And before we talk about that in detail, I'd like to ask you about your field of activity. Has anything changed since the first interview a year ago?

IP1 [00:03:23] No, that's actually stayed the same.

I. [00:03:25] Okay, I'm sure you've already completed the UEQ survey, right?

IP1 [00:03:32] Yes.

I. [00:03:33] Great. Okay, so that means you clicked through the prototype as well? By the way, when I say prototype, I also use mock-up as synonyms or just app, not necessarily a mobile version, but generally an application for evaluating sensory marketing in e-commerce.

IP1 [00:04:00] That's exactly what I did; that worked out well.

I. [00:04:03] Wonderful. Then, I want to give you a quick outline of how I structured the interview. And that is, I broke it down like this into four parts. Firstly, I would ask you about usability, that is, design, then in terms of information content and linked to that, comparability, because these are all points that had ultimately emerged from the initial expert interviews. Accordingly, I formed these as categories, used them as a basis here, and subsumed short, concise questions in them, and finally, also about the financial aspect. What advantage would the whole thing bring for companies from your point of view? I also have another question, but start with the first one: If you've used this mock-up, this app, and clicked through a bit. From a usability perspective, is the mock-up well-designed and usable for a natural setting? So, if you had to use it in your everyday business now?

IP1 [00:05:26] Sure, basically, yes. Specifically, for my business, I also asked myself whether the tool should ultimately refer to pure websites such as the example site of Nespresso. Or could you transfer this to the Amazon world, where I am now, and then evaluate brand stores' sensory communication with it? That's actually a question I've been asking myself, mainly because we've also been working with Nespresso to some extent. That would be my first question, even if it has nothing to do with usability itself. But in the end, of course, I took a closer look at the mock-up and had a good feeling about the idea of how you can work with it. One question I also had was whether it would ultimately be available in different languages? I always work with customers who speak other languages, and there are always customers who only want to communicate in their language and only want to work in their language. And it makes sense to map this in different languages. Ultimately, this also has an impact on usability.

I. [00:06:39] Yes, thank you very much for the feedback. Exactly. Yeah, that's a good question. Definitely. If it's going to be implemented at some point. But that will no longer happen in the context of the dissertation then, but somewhat afterward because the goal of the dissertation is first to determine the need for sensory evaluations in e-commerce and then to check whether it is generally possible to evaluate sensory content in e-commerce manually and then automatically using Big Data methods, and to pass the results on to experts for final evaluation. I.e., the mock-up presented to you is now such a first setup, which is based on all my investigations carried out in the background and should visualize them. In any case, there should also be another language variant, i.e., several. And as you said correctly, the adaptation to other areas is absolutely necessary from my perspective and should be done. That also means for Amazon because you can perhaps use the content - and you're the expert on Amazon - with perhaps minimal adaptations, especially the images and the texts. Especially for brand stores, I think that would be a really good thing. I always write that down, but currently, it would not yet be included since the tool primarily refers to e-commerce websites or stores. But you could also extend this to apps that are actually only available on mobile. This is actually transferable to many, many other areas.

IP1 [00:08:26] Ultimately, you can also work with videos and images in brand stores, and you're a bit freer with text anyway. Regarding usability, I wrote down what I found really exciting about the "Click to Details" area. Here,

you can hover over the elements and then also get a signal that you can open something here by clicking on it. That actually hasn't been with the overview above. I don't know. Of course, that could be because it wasn't possible in Figma, but basically, I find it super exciting when you get feedback that you can go further in here and open something because it was broken down much more here. You were told, even verbatim, what you could write here at this point, for example, to address olfaction, acoustics, or other senses. I think that is actually one of the most interesting things for people who ultimately use it because they are immediately told what I could do better here.

I. [00:09:35] Okay, thank you very much. Do you have any other aspects of usability? Otherwise, we'd be right into the next point, which also feeds into what you've just alluded to.

IP1 [00:09:42] No, then we're welcome to go to the next question.

I. [00:09:44] Okay, because the next point would be the information content. And there would be the question of whether the specific information provided to you in this mock-up in terms of sensory communication quality meets your expectations or how you find that.

IP1 [00:10:12] Yes, of course, as I just said, otherwise I probably wouldn't have noticed it directly. At the end of the day, it's always a question of how much prior knowledge you have. Because I now also have prior knowledge about sensory marketing, I was, of course, able to get to grips with it straight away. But I think that even someone who only deals with this tool he can see relatively clearly what it's all about in detail. Is it now about acoustics or perception, i.e., vision or olfaction? In addition, you also have a rating. And finally, what can be done better? And I think that's by far the most exciting thing about it, that you actually get the suggestion directly here, without having to think about how you can ultimately make it better. So, I would say that the information content quality is definitely high enough. The only thing I still wonder is why not all indicators are shown in the recommendations. For example, if I now click on the audio content, why do I now only see A3 and A5? Are these only given as an example for now, or? Why are we now not A1 to A5 given?

I. [00:11:40] Right, those are examples. You mean at the bottom, in the area of what you're already doing well. What's actually completely listed are the action points that you have where you can still improve. In the sensory indicators that have already been rated well, for now, they're just examples, but you're right; that could be expanded.

IP1 [00:12:07] Okay. Then, I missed that the indicators that are good are not in the Recommendations at all.

I. [00:12:15] Yes, they are shown. But on a component basis. I have that broken down by the different content. So, for example, on the dashboard page in the text or image area. And if you hover over that and click, yes, you get on those improvement pages that you mentioned.

IP1 [00:12:40] Oh, that's right.

I. [00:12:41] Then you see a little bit further down, "See already good sensory text results of the website." There, you see again where you have a full score, and you also get an example of how you wrote that there and why the score turned out good in that case.

IP1 [00:13:02] Ah yes, okay. I assumed that the five indicators that were shown here were based on the senses, i.e., smell, feel, taste, etc., and then I clicked on the far right, for example. I thought that only the sense of touch was the subject of this section. There were now only the three pictured, and I had wondered where the other indicators were.

I. [00:13:24] So where in the mock-up are you exactly now, if you don't mind me asking?

IP1 [00:13:28] In the Sensory Interactive Media Content section. I thought that's where all the indicators were listed then in terms of haptics. But I actually understood now how that was broken down.

I. [00:13:47] Okay, I see. But do you think that's a problem? The way it's broken down? Is it hard to understand?

IP1 [00:13:58] So, as I said, I actually thought differently, but maybe I didn't really look at it, that you didn't name it after the senses here, but how it looks on the website. And ultimately, for someone who develops or designs a website, these are probably the five decisive points in how they design it. So, I could well imagine that this also makes sense.

I. [00:14:25] Okay. Are there any specific pieces of information you can think of that might be missing? Or even information that's redundant? Or is it pertinent?

IP1 [00:14:44] I think it fits so far. The only thing that irritated me a bit at the beginning was when you scroll down a bit further on the dashboard, where the individual indicators are listed; for example, the haptic indicators H1 to H14 are logical, then, for example, 0 to 1. So, either the rating can be weak or standard. I wondered what the bars next to them were for. Until I realized, of course, that it was grayed out.

I. [00:15:13] Yeah, that's right, I probably should have changed the color (laughs). You got that right. Yes, I had thought about that so that you don't believe that you could achieve more there, but there is only zero or one, for example, with the H4. That's why I entered the value range, and that was now my compromise solution to somehow map this in this table as a horizontal representation next to each other. I had never displayed it that way before. And then I said, okay, you must somehow gray out the value range that is not achievable in specific indicators.

IP1 [00:15:52] Yes (laughs), I finally understood it, but I was initially wondering what the bars were supposed to tell me because I had perceived them as a diagram. But now it's understandable for me.

I. [00:16:04] Yes, but it's good to know because you could also write there that these values are not achievable. So, just think a little bit more in the direction of the user who hasn't known the tool for that long.

IP1 [00:16:21] Maybe it would be enough if the bars stay, and then you hover over them, and then you get the message as a pop-up.

I. [00:16:28] Right.

IP1 [00:16:28] At that point, it would then simply show that a higher value is not achievable. So that, for example, there is only a range of values between zero and one for some indicators.

I. [00:16:35] You mean that that's when it first appears, or it's already displayed like that before? And then when you hover over it, you then get some additional text displayed?

IP1 [00:16:44] Exactly. Because ultimately, if you have text everywhere now where there are these blue bars, that here that's not possible. If you ultimately ask yourself what the bars mean, then you probably inevitably hover over them anyway. And so, you could then still get the information, okay, to know directly what this is about and that the value range is limited.

I. [00:17:12] Yeah. Okay. Good. Then we were just thematically on the dashboard side for your own company. Another aspect that was mentioned in the first interviews is the comparability between or with other companies, especially your own industry where you work. Now, I took the example of Nespresso. In terms of market definition, the relevant competition is, first of all, the food industry and then the coffee market in particular. And then I included Lavazza and all the others. What do you think of the comparability function in the app? Is it satisfactory for you? Is it in line with your expectations and also the potential business needs?

IP1 [00:18:08] So I didn't notice anything negative about the comparability. I think it's understandable from the outset. The only thing that I was wondering about is that, of course, there is certainly a basis on which the competitors are selected, but whether I would then also have the opportunity to say myself, okay, I would now like to compare myself with this and that competitor. That would certainly be exciting if, for some reason, Nespresso were to say, Okay, my biggest competitor is someone else, and he's not listed here. Would there then still be the possibility to insert this manually somehow, or does this work anyway so that I can enter the URLs of other brands as I enter my own URL, for example, in order to be able to compare them? So that would be the question now anyway, whether and how that ultimately works. Whether I now enter URLs here or whether this simply works automatically because the AI or the tool knows that I am Nespresso and sell coffee; therefore, these competitors are displayed.

I. [00:19:18] It is intended as an automatic selection that automatically selects the direct competitors from the industry you are supposed to do the biggest business. But I find your hint super interesting. I have not had so far on the screen that you could do that, that you can select yourself from a number of companies. But what should always work in the then functional version would be entering your company link (URL), i.e., the website, at the beginning, and then the whole thing can also be displayed for the other company. So, this version should definitely

exist. The comparability, I agree, could then be expanded even further. Okay. Are there certain components in this benchmarking that you would then compare that seem important to you?

IP1 [00:20:16] Well, I would say that the most important thing for me, if I were to put myself in the position of a company, would be the overview with the sensory communication. Because at the end of the day, the keywords or this word cloud chart, what's also listed under there, I'm sure I should already be familiar with as a company. Otherwise, I would probably do something wrong in marketing if I didn't know my keywords (laughs). Ultimately. Also, regarding the tool, I think the table with the overview and the individual values makes the most sense. Namely, to understand how the haptic sense is addressed in my case compared to, for example, Lavazza as a competitor. That would certainly be the more crucial information. The only thing that could be made clearer would be a display on the dashboard. Here, we always talk in percentages, i.e., 40% haptics, 25% olfaction, etc. In order to generate even more comparability, the values could also be given as percentages for benchmarking, analogous to the dashboard.

I. [00:21:29] Yeah. Okay. Good point. I'm seeing it right now, as well. Yes, actually, you can represent that as a percentage as well. That's not a problem at all because, basically, it's a range of values between zero and one. And then there is either 0% or 100%. And since it's probably .51 for the haptics of Lavazza, for example, you could have gained a text-related score of 51%.

IP1 [00:21:54] So, in the beginning, it's always talking about percentages, actually. And then you could also compare this here. Whereby, in the end, with percentages, the question is always, what is 100% in this case?

I. [00:22:10] Yeah, right. Definitely not necessarily always the best. That actually needs to be said about that as well. Okay, then, one final question about the mock-up itself. Are there any other aspects that we haven't even mentioned yet, that we haven't talked about yet, but that you think are important for a meaningful evaluation of sensory content in the online space that might be completely missing from this framework now?

IP1 [00:22:50] Um, sure, what I would also mention is, for example, weighting. I mean, I also dealt with that in my studies, whether you should weigh depending on the industry or brand or whether you consciously decide against it. That would be a point that, from my point of view, has not yet been taken up, and I have also asked myself, with regard to the handling in general, what I would have to bring along as a user in the end. Would it be perfectly sufficient for me to have a website now and then just put in the URL? Or do I still have to provide information about the company, or does the tool do that completely independently?

I. [00:23:41] Standalone. That would be the intended approach, that the tool works like, for example, similarweb, so similar tools, but designed for a different circumstance, like SEO. It is here just so that the app basically only works with the URL and could already work with it. Of course, if you create an account there, you would have even more functions like the look into the past. One more sentence about the weighting. It's important that you

address this. However, the values listed there already correspond to a weighting in terms of the recommendations, but not at the holistic level due to reasons of quick understanding.

IP1 [00:24:33] Ah ok.

I. [00:24:34] But it's good that you bring that up. Because if it's not so obvious, then it could be written more clearly (laughter). There is already a tab in the navigation bar with Concept, and it explains how the tool works and which weighting is behind it. But you can also clarify that the values shown there already correspond to a weighting specified for the coffee or food industries.

IP1 [00:25:16] All right. Okay. Then I got that. Fits for me.

I. [00:25:18] Okay. So, are there certain aspects that you particularly like? Or are there certain aspects that you don't like? Feel free to give open feedback on that.

IP1 [00:25:32] As I said, there was nothing that I didn't like at all that would scare me away from the tool. From my point of view, the most interesting thing is this detailed overview, where I also get a suggestion for what you could write, what kind of picture you could show, etc. In fact, images are also displayed in that case. I guess how that would be implemented, for example, pictures, right? Then you can also get quite a bit of inspiration. That's the aspect that I would particularly praise.

I. [00:26:17] Okay, let's move on to the area of potential business impact. If you had to give an estimate for the tool in an improved and functional version in percent, what the use of such a tool could bring you financially - what would you assume here? Maybe you even have experience in the Amazon area? What happens if you change the content there? So, how does the traffic change if you use images A or B? Is there some kind of sales uplift that you can limit/estimate as a percentage? I'll give you an average reference value from my side as well. On average, you could say that content optimization could have a financial impact between 0 and 15% approximately. Can you give me a value if you just had to estimate now?

IP1 [00:27:42] I would now also want to spontaneously name something like 7%. Ultimately, I think you can probably achieve a little bit more with ads and paid advertising because you also mentioned reference tools like similarweb before. But I also know this from the Amazon world. It's similar there. We also advertise with numbers. We also have an overview of what sales were ultimately made via the brand store, how many more clicks you have, and ultimately, it's always within a 5% to 6% range. But that's not bad, of course, because if you consider what large companies ultimately sell and what 5% more means for such figures, then it's not negligible or to be talked down.

I. [00:28:40] Very interesting. Thank you for the useful insights on Amazon on this point. From your point of view, are there possibly other financial influences that the use of such a tool could have? I'll just say an example now: return rate.

IP1 [00:29:00] How exactly do you mean that now? By using the tool, do I have cost savings or cost benefits?

I. [00:29:12] No, that's actually not what's meant, but rather that you can optimize your content again by using this tool. They don't necessarily have to be bad, but they can possibly be finetuned. Nevertheless, it may be that, for example, in the fashion industry or in the concrete example of Nespresso, you can force a better sensory description of the taste that this coffee will have. That one formulates even better, perhaps enriched with pictures, so that the person is not negatively surprised when he holds the product in his hands for the first time or tastes it. Well, returns are probably less of an issue at Nespresso because then you just don't buy the product again. It would then be the lack of repurchase, which would be a second possible aspect. But what I mean by returns, especially with clothing, is that the fabric, for example, must, of course, be well represented. If you then notice after the fact, oh, the product is somehow haptically not appealing. But that was not so clear before the purchase on the basis of the content presented. In such a case, it would have been possible to write in more detail how the fabric feels. This ultimately leads to a reduction in returns. Now, I have anticipated a lot. The question would then be along the lines of: Would you agree with it? Do you have any other ideas on what the tool could have a financial impact on?

IP1 [00:30:51] Well, I would completely agree with that because, as I know it, in our country, companies are ultimately interested in their customers being satisfied with the products that they sell. If we restrict ourselves to products and don't go in the direction of services, then I think that customers are satisfied with the product if they have also received what they expected. And the better the content is, of course, the more likely it is that the customer will be satisfied with the product and that his expectations will at least be met. In the best case, of course, they are even exceeded. Accordingly, it is not extremely painful for a company if a product is returned. But it's not just that, it's also the fact that it might not be bought again, that you basically say to someone else: "No. So the product wasn't what I expected. The garment was not as pictured." And that's where, of course, from my point of view or from the point of view of my work world (Amazon), the number one goal is always to communicate to the customer as well as possible what they're getting. In the event that the experience can nevertheless also be negative, I would like to briefly give an example. Among other things, we also advertise for stores and sites of smartphone manufacturers. As is now also common, one or the other manufacturer strives to act more sustainably and therefore omits charging cables, and this is also openly communicated in the content because the disappointment is ultimately much greater with the customer if this cable is not present, although he had assumed that it was included. In my view, this is an important example of why content is so important. It's not primarily related to the OSMI tool, but it's in the same vein of describing how clothes feel, what they're made of, and how they feel on the skin. And the same, of course, with taste or smell, e.g. with Nespresso. If you try to reproduce the taste as well as possible, you can also give the customer the opportunity to find his way around your own range better. So, if the customer now has the option of choosing between three/four different types of coffee and ultimately decides on the best coffee for him on the basis of the content, he is, of course, the happier customer.

I. [00:33:17] Exactly. Another thing that comes to my mind is that sometimes, senses are tangentially affected that you don't even have on your radar. You buy a piece of clothing that you like, and then it smells like chemicals. But

that's certainly difficult because do you want to openly address that on the website? (laughter) Or you communicate openly that the strange smell is normal initially and that you should rather let the garment air off first. Yes, you also think about the other sensory influences that could occur there, and that you then combine them with each other. But good, you've mentioned some really interesting aspects again. Have we forgotten anything else about the whole field from your point of view? Would you like to add anything that you can think of that we haven't mentioned yet?

IP1 [00:34:13] Hold on, I'm just going through my notes.

I. [00:34:17] You even took notes. Yes, exemplary (laughter).

IP1 [00:34:20] Yeah, sure. I looked at the tool, of course, and then I also thought a little bit about what else was available and whether I could think of something else. What I was thinking about is whether you can also use this as a plug-in for a browser, for example, to go to websites, and then within a few seconds, a sensory value is generated, or potential improvements on the page are shown directly. Of course, it is also a question of whether this can be implemented so quickly from a technical point of view. Then, you would get a value generated directly, e.g., one side now has an OSMI of .40. The other side, for example, has a different value, and you can see immediately why this occurred. For example, Honey does something similar with the plug-in function that picks out coupons for a website on which you are currently. The only difference is that you don't get coupons here, so to speak, but the value of the sensor system, I'll say, and that you can theoretically also save websites quickly. That would be another point anyway, although we had already more or less answered that, namely, that you can also look at different websites and not just your own in the OSMI tool, especially from the point of view of someone who works in an agency that doesn't just have one customer but 20 customers, for example. Then, of course, you want to analyze 20 websites and not just one. But I think, as I understood it, that this should be theoretically possible.

I. [00:35:53] That's right. That's the plan. Very good. Great answers. I don't have any more questions about the app now in that respect. I would just share my screen very briefly in conclusion. I still have a few questions or statements in conclusion. My request would be that you just spontaneously give your assessment here, that is, how you assess yourself in the statements in terms of your expert status. Based on a corresponding scale, there are a total of seven statements. As you can see, these are now on a Likert scale, and here, I would simply ask you to give a self-assessment of the aspects that are now here. If you now read the statement that you are a marketing expert, how would you rate yourself here?

IP1 [00:37:57] I'll put it this way: I think an A is always difficult to describe yourself as far as being a complete expert because there are still things that you may not know. But at the end of the day, I already worked in marketing mainly in my bachelor's degree, and in my master's degree now, the same link. I've been working in

the field for two years, so I would see myself somewhere between agree and neutral, so between 2 and 3. But then I would still take the two - agree.

I. [00:38:43] Okay. Are you an expert in sensory marketing?

IP1 [00:38:55] There, I would say, due to the fact that I also wrote a whole bachelor thesis on the topic, I would actually take a one here; I strongly agree.

I. [00:39:06] Okay. Are you a web design or digital media expert?

IP1 [00:39:17] Does web design include graphic design work?

I. [00:39:23] Also, basically quite broadly defined.

IP1 [00:39:26] Then I would say a three (neutral). For example, we also have experts who are then assigned to the graphics team, and then on the other side, there are the editors, which I count myself as one.

I. [00:39:38] All right. So, do you see yourself as an e-commerce expert?

IP1 [00:39:44] There, I would say two, agree.

I. [00:39:49] Okay. And do you know anything about marketing analytics and campaign management? There's certainly much, much more that I haven't listed here now. That's why I listed it in the analytic marketing section.

IP1 [00:40:11] Ultimately, we also have the division between SEO and SEA with ad placement and advertising in general. I don't have any contact points with that now, for example. But I am 100% in the area of content optimization. Accordingly, I would then also say because it does not completely cover the area, I also agree here.

I. [00:40:33] All right. Then we'll go to the last two statements, but this time, they're in school grades. How would you grade the solution presented to you for the problem originally identified and the task of sensory evaluation of marketing content in the e-commerce space? By solution, I mean the mock-up in particular.

IP1 [00:41:17] I'd give that a two, good. But I think that even if the other things are still so far changed, it should certainly come out with an A.

I. [00:41:33] Okay. So, you've now heard quite a bit about my specific dissertation topic within two interviews as well. So, how would you consider yourself now in general in the combined field, so your expertise in school grades in the field of sensory marketing and its evaluation in the e-commerce field?

IP1 [00:42:02] I would give myself a two, good, there too.

I. [00:42:07] Okay, that's about it. I can save that, then. Thank you very, very much. And then, if you don't have any other comments, I will close the interview.

IP1 [00:42:18] No, I have nothing more to add.

I. [00:42:20] Okay, well, thank you very much for your time.

- End of Interview -

Appendix 20. Interview IP2 for second SSI

I. [00:00:06] Welcome to the 2nd interview. It's good to have you back. As I mentioned, the second interview aims to take a closer look at the dashboard mock-up for sensory marketing in e-commerce. I use the term mock-up as a synonym for app or prototype. The goal is to evaluate the mock-up from different points of view and from the interviews I conducted in the first run, including your interview, basically as categories have emerged that there are 3 to 4 aspects that are important. One is usability, so it has to be easy to use in quotes, and it has to contain the information that you need. It should also enable comparability with other manufacturers or competitors. And, of course, it should also take into account a financial aspect. The interview is based on this, and the questions are manageable. You've clicked through the mock-up, and I'd like to start directly with the first question regarding usability. That is, purely in terms of design, structure, and how you can find your way around. Would you say that this mock-up/app is well-designed from a practical point of view? So, can you imagine that it would be well applicable in a real setting, i.e., in a business setup, from a usability point of view?

IP2 [00:01:49] Yes, definitely. So, it took me a few minutes to understand what it means now and where the information is shown. But then it's also very intuitive. That you can fold out content, even if you've clicked through it yourself based on a mock-up, and if it were live, some things would be different again. But I found it logical. And as I said, it took me five minutes to understand it all. But I think that's the case with any major tool that gives you information. And you can always tell that in Google Ads Analytics. You always have to understand where you are on the page and what information you open or call up. Everything is described individually, where something is shown. This legend in the tool explains which element means what, and I think that's good. Because then you can look at the content in detail and take action based on that. It also means that you can work with it a lot. So, it's not like a one-time analysis, but you can go in again and again, then optimize the sensory communication, and then you know after the first use how it works. That's why I think it's good that it's structured like that. So, I was impressed.

I. [00:03:04] I'm glad to hear that, of course. Then that would actually be it as far as the usability aspect is concerned. The next aspect would be purely the information content that this app offers you. Would you say that the specific information you can take from there regarding sensory communication quality is according to your expectations?

IP2 [00:03:29] Yeah, definitely. What I thought was particularly cool was the recommendations because that was still such a bonus level for me. It's not just saying that multisensory communication is not pronounced enough, but that you know exactly what you can do. And then each company could interpret that for itself. For this purpose, concrete indications are given in the tool so that the customer can, for example, better imagine the taste and is stimulated to make this imagination in the first place through the optimized content. Each company can then translate this into its own language. But as a clue to sensory optimization, I think it's really, really good! What else I thought, even if I don't know whether it falls under this point exactly, but purely practically if the CEO now

says he has read something about sensory communication in e-commerce and then decides, we do that now. Then someone gets the task, and I think what could further enrich the app would be if multisensory communication is not seen as an end in itself. So, as a suggestion, you could not only write that the customer should imagine the taste, for example, but because, in the same industry, this adaptation has led to up to 8% more conversion. I don't know, so of course, that's data that you have to have first. But such a justification why this now specifically helps here and not just that with it, the OSMI then increases. By that, I mean that the increase of the OSMI is not the only goal; connected with that, the conversion could also be improved. I would find that even more convincing, but I also find it very good now.

I. [00:05:31] That's actually a good point. That is information about what the application of the then-finished tool offers in practice in terms of added value. I've seen that reflected as well. However, you are the only one so far who also underlines in this context that, of course, you then test the tool in a live environment with real companies first, and that, in the end, actually exceeds the scope of my dissertation, which is primarily about identifying the actual need for evaluating and optimizing sensory e-commerce content and implementing it using artificial intelligence. So, the focus of the entire dissertation is actually on a) Is there a need? b) Can the whole thing be automated? Automation always runs together with computer methods, such as artificial intelligence. So, we have done all that and examined it. I.e., Can texts, images, etc., be analyzed and evaluated in an automated way at all? And then to show a solution proposal, how the whole thing can look in the end, e.g., in the form of a dashboard, which you have also seen, tested, and even evaluated. What that brings in the end, of course, you have to find out in various types of research. At the moment, however, it leads to an increase in efficiency in marketing practice. And there are many other examples, such as similar web, which also specifically indicate the financial impact. But I'll come back to that in a moment. Of course, they indicate what this tool also brings in monetary terms, so to speak. Because as you said, this is a classic question for a manager; for example, if I use this in practice, what does it bring me? And that's an important question that I can't really substantiate in detail with a figure but is not the core of my work. Rather, this could be the subject of future research, for example, via A B tests to determine how an optimization on specific individual examples affects the conversion. Basically, however, I can say, and so it is also in the tool, that the indicators are scientifically based, that these can have an impact, whose degree of effectiveness, however, one would still have to measure in the overall view. But that's a good aspect; thank you for the comment. Beyond that, is there any information you're still missing? Or information that you might also find superfluous?

IP2 [00:08:00] Let me think, per se, I don't miss any information. If I imagine how I use the tool in practice, I could start with it precisely because there are these recommendations. And then, of course, it is the question of each manager to see to what extent it is really practical. That's always the case, regardless of whether it's Google Ads Analytics or something else. Every tool suggests something, and then you basically have to see how and whether I can implement it myself and whether it is purposeful for me. What would my own visual language look like,

etc.? I had asked myself, with the rider “History,” what it has to do with engagement. There, I wondered where this now comes from. Or I misunderstood it. But the point is, first of all, that sensory communication is evaluated. And then I didn't understand the point of history. That's when I thought, do we need this here now? Or it's another aspect that is somehow still to be rolled out? Maybe you can explain that to me as well, so I can understand it.

I. [00:09:17] Yes, actually, that would be another on-top level, that you still integrate social media, etc., there. That would be the next aspect. Also, because social commerce is a growing topic, you integrate this area into the pure website. But you're right; I also notice that at this point in the mock-up, the description is not precise enough.

IP2 [00:09:43] Yes, exactly. So, if the tool would go live now, then that could be omitted in my eyes currently. But despite this, I think everything is really well-structured, understandable, and logical.

I. [00:10:04] Okay, then there's another area, it's called benchmarking in the mock-up, which is to show the comparability to other competitors, especially in the same industry, in the same competitive environment. There again, the same question to you: Is that satisfactory or according to your expectations if you would want to compare your e-commerce multisensory?

IP2 [00:10:33] Yeah, I thought it was very cool. I'm just opening that up to myself as well. You're also asking about my expectations. Yeah, so it definitely meets my expectations. It lists which Nespresso competitors come into consideration and what values these companies achieve. I think it's mega cool that it's also broken down again according to the five human senses and that the overall index is then shown. And beyond that, there's even this word cloud chart built in. So that was another moment for me: "Wait a minute, what do I do with this now?" But it is, first of all, such a rough integration, such an analysis, probably of the entire text. Which words are used, and how often can you see a little bit where you stand, whether you cover that or whether you want to differentiate yourself from it? For example, to create a USP or a special value. I find it helpful; also, perhaps it probably depends on the manager / the user. Of course, this can be explained in a little more detail what you can do with it now. But first, it is additional information, where then everyone must decide for themselves. I mean, the tool can't specify everything. That would be too hard because then it would also replace a lot of mangles, which the user himself probably wouldn't like. So, I think it's good, that rounds it off again to see a little bit why I should get better at sensory communication in e-commerce.

I. [00:12:12] So, I have deliberately reduced the specific information in benchmarking to a quickly readable dashboard. Of course, it would have been possible to integrate the whole thing here so that you can click on certain things, on a further overview as with your own presentation, and get detailed information displayed there. So, for example, in relation to corresponding text content, which one does not have yet, the relevant competition is a disadvantage, which one could compensate for. With the other elements, this would be just as integrable. But currently, it is only on the dashboard level. But in a version, when it is hopefully finished at some point, you can also analyze it at a detailed level compared to the competition.

IP2 [00:13:15] Very good. Of course, a tool like this is always growing, as with established tools like Google Analytics, which also had to develop first. When this was launched back then, certain functions and new ones were always added, and it was easy to get overwhelmed. But basically, it would be outstanding if the tool is completely finished before people have even worked with it. Some functions come then only in the go-live, or it is only noticed that there should be certain additional functions, which are then still integrated.

I. [00:13:40] Right. And sometimes, user feedback is simply necessary. You give the first feedback now, and seven other interview partners. But a tool like this has to be tested with smaller target groups in a live version and then larger. It always takes a certain amount of time. In this context, the final question is about the design and the tool in general: Are there aspects we have not yet highlighted? From your point of view, are there certain things that would be essential for a sensory evaluation in this framework that we haven't mentioned yet, or is everything covered so far?

IP2 [00:14:26] Well, I didn't miss anything in the tool. Of course, I'm not an employee of Nespresso, so I couldn't evaluate the suggestions from this specific perspective, but basically, I find them very logical and appropriate.

I. [00:14:43] That means you mean your own company example?

IP2 [00:14:46] Yes, exactly. But I really went through the tool with the intention of putting myself in the position of an employee of this company, but I can't say in detail whether everything is already covered. But overall, I'm not missing anything right now, and I think that I could work well with the tool.

I. [00:15:13] Okay, two supplemental sub-questions I have on that. Which one or which aspect do you like the best? Which one do you possibly not like so much at the moment?

IP2 [00:15:28] Yes, what I like very much, what I've already said, are the recommendations right next to the tabular presentation of the details. You can quickly see what it is about and how much I use of it and then directly the recommendation. I think the recommendation is super. That's really very, very practical to go on directly with it. What I don't find so good, because I didn't understand it directly, is the History section. It has already been said. Otherwise, I think you can still take a bit more the user by the hand and explain why the optimization or change of content in some areas is now useful. And so, a bit where what is shown, the user can perform more through the tool. So, for example, explaining how to use it on the home page. But that would be the only thing where I would say that you could currently still optimize.

I. [00:16:34] I agree with you there. What is definitely still missing in the current version is that it still needs to be optimized for users who have very, very little contact with the whole topic of sensory marketing so far. Certain basic knowledge is currently still required. That's why I'm currently still talking to you on an expert level, with people who are well versed in this multi-layered complex of topics. But absolutely, I agree with you. You have to make it a little bit more tangible, a little bit more approachable. Okay, thank you very much for that. Then, I would have one or two questions in the area of the financial aspect. My first question would be: If you had to evaluate

the potential of this tool, i.e., the business impact in the area of day-to-day business if one were to work with it and improve one's website, how would you estimate a percentage value here on the key figure of sales? I can also give you a range of values that I give everybody as a reference to that question because I based it on what others give. So, for example, SEO and content specialization tools give a value range from about 0 to 15%.

IP2 [00:18:23] That's a good question. From a business impact point of view, I would definitely compare the tool to similar web or Google Analytics so you can analyze and improve the specific area of sensory communication. So, it really depends on how you start with it. If we say that you would use the current status of the tool for comparison, then it's not that comprehensive yet. But I would see it in principle in the same area. I would then maybe not go to the 15%, maybe up to 10%. But that I think, you can already say, because it would just have a business impact.

I. [00:19:16] Okay. And are there any other financial aspects related to sensory marketing? When you start optimizing, what financial (direct/indirect) could still be impacted here, if any? I'll say two examples now: Efficiency in marketing or the return rate issue. In your view, are these aspects that could be affected by this?

IP2 [00:19:45] But. Yes, that could also be add-ons. What I see first of all is that right now, the trend is that it's more and more about designing the website, the web store multi-sensory. Of course, there is also a "too much," so the tool also analyzes the design of the website, but I imagine that it is great if you have a lot of text on the website that says, "Please imagine the taste," now "please imagine this." I mean, it can also be exaggerated in this area, and I would see it as further added value if the tool also indicates that. I think that is also very difficult to analyze because it is just equal to better. And I would see that as a further analysis in it. But you just mentioned returns, didn't you? What was meant by that was that the customer knows more about what he's getting beforehand. Did I understand that correctly?

I. [00:20:58] Exactly, that he can deal with it better. For example, if you're in the fashion sector and you see an absolute zoom shot of the fabric. So that you are better aware beforehand of how the product feels in the hand and therefore you return less.

IP2 [00:21:19] Okay, that, to me, would be a classic benefit of optimizing multisensory online content. I see that, in particular as the reasoning behind the tool, that it's used as an argument by conveying how other companies have already been able to realize a reduction in returns of, say, 8% by optimizing in the sensory area.

I. [00:22:01] The other thing I brought up was the efficiency of the manager or executive hand doing content on the web. Do you think there can be an increase in efficiency as well?

IP2 [00:22:18] Oh, yes, definitely. So, if that was the question, then analogous to the return rate, I think the tool could have a positive impact. So, therefore, definitely. So that's why you do multisensory and pay attention to that.

I. [00:22:33] Okay, one more quick note on your previous statement. You had just said that currently, more equals better. That's actually not quite the case because the OSMI is already supposed to be a weighted value. And that might be a little bit because it's explained too hidden. At the top of the navigation bar, you can click on Concept. There is an industry-specific weighting so that the senses are weighted differently depending on the industry. With Nespresso, however, I have really already chosen an example that can really address several senses in a meaningful way. But in the automotive sector, for example, talking about taste makes relatively little sense. I just wanted to mention that briefly. The weighting is included but should perhaps be made clearer.

IP2 [00:23:42] Oh well, no, then it's all clear to me, right?

I. [00:23:46] Final question: do you have anything else that you would like to add? Did I forget anything from your perspective that hasn't been mentioned yet?

IP2 [00:23:56] What I would find interesting is the explanation of how this all works. So, what is the trade secret? How exactly is the calculation done? How does the tool work? Especially for people who are not so deep in the topic, that could still be important from my point of view because the topic of sensor technology is not yet so far on the market. It is self-explanatory. I think Google Analytics would have to explain little today, do's but still strongly. So, there is still a reason why it is useful and also, again, how it works. So, for example, one explains that after entering the page/URL, all images, text data, etc., are analyzed. And here I also wondered if the whole website is checked completely or just individual pages. This could be named, or, for example, a selection could be made based on the customer journey. For example, the classic e-commerce customer clicks on XYZ subpages, and this is then specifically examined based on the pre-selection of the users of the OSMI tool. Especially with extensive websites, many subpages are not seen at all.

I. [00:25:34] That is a very good aspect, very interesting, very important. Also, in terms of methodology, how does the tool actually work in the background? I also think it's very good that you mention that. I could have added that now. I'll include that as a point for improvement. And basically, it's a Big Data analysis. That's what it's called. You sort of give the URL as the basis and the whole Big Data infrastructure that's behind it, which would then basically crawl after, for example, the text and analyze those as well as evaluate them. This would currently include the entire website, including all sub-pages. But you could specify the whole thing on your own request, that you say you want only up to the 1st or 02nd level, subcategory, etc., or leave out certain specific pages from the analysis. Currently, however, it is intended to screen and evaluate the website as a whole.

IP2 [00:26:31] I see, all right.

I. [00:26:32] Exactly, and because many indicators are also meant to be cross-cutting. That means, theoretically, you don't need to go to the very last page. Automated, that's just less of a problem, but it takes maybe a second longer. At the moment, the tool would not say concretely on pages X, Y, and Z this one improvement must be made. Rather, it is currently meant rather heuristically, as a bird's eye view, more or less. So, it analyzed the URL,

including all pages, and looked at what is generally done well and what is less good. Of course, even then, it still remains a manual effort, just as many SEO tools now do not say exactly where or which keyword should be inserted to rank directly on Google 1. But you have really called me very interesting points, which would be the end of my specific questions about the tool. I would have a few more questions, but that's really quick regarding your own person or expertise. That is, there are seven statements in total, and this is about evaluating your own expertise. As you can see, the first five statements are from 1 to 5 on a Likert scale, and the last two would be in school grades. And maybe we'll just start with the first statement. Are you an expert in marketing?

IP2 [00:29:35] I would confidently give myself an A there as well (I fully agree).

I. [00:29:42] Do you know about sensory marketing? Are you an expert in it?

IP2 [00:29:48] I'll take a two (agree). So, I also through my master's thesis in the field.

I. [00:29:54] Are you an expert in web design/digital media?...

IP2 [00:30:02] Yes, also, the two (agree).

I. [00:30:08] Are you an expert in e-commerce?

IP2 [00:30:11] I would also give myself an A (I fully agree). So, I mean, you can always know more, but I consider myself very good at my job.

I. [00:30:21] Last statement. Marketing analytics is a broad term that I have used. There is certainly much more to it. For example, SEO/SEA campaign management and advertising management. In principle, all activities in eCommerce that you can, I say, also review. Are you an expert here?

IP2 [00:30:45] Yes, of course, I've worked a lot with that. I would still give myself a two (agree) because it's been less part of my daily business lately.

I. [00:31:01] Then the last two statements, but this time in school grades, as you know, from 1 to 6. Because the first statement would be in school grades considered on the solution presented to you, it's the mock-up. How would you evaluate the whole thing in school grades now? In relation to the originally identified problem/need for sensory marketing evaluation in the e-commerce sector?

IP2 [00:31:45] I think it's great. So, I talked about what can still be added and what may have some optimization possibilities, but I think it's very good related to the purpose. So, in itself, I can give it an A here (very good).

I. [00:32:04] I'm glad to hear that. Lastly, the question: You have now been through two interviews, previous conversations, and also through your master's thesis earlier. Yes, a lot also from the field now. How would you evaluate your expert knowledge specifically in my dissertation topic? In other words, sensory marketing in the e-commerce sector?

IP2 [00:32:47] So I give myself a 2 (good) here. Especially because I also read a lot about it every day.

I. [00:33:00] Okay, that's it. Then I would save that now. I can also finish the presentation already. Thank you again for your participation in the 2nd interview!

- End of Interview -

Appendix 21. Interview IP3 for second SSI

I. [00:00:05] Okay. Wonderful. So, you did look at the tool. That worked out well, didn't it?

IP3 [00:00:13] Yes, exactly. I had to find my way around and see how it works on my Mac. But then, of course, I quickly understood that on the left is the navigation, if you can click through like that. And then.

I. [00:00:24] Yes. Very nice. Yeah, that's also the great thing about this tool: it basically works regardless of the platform. So, whether you're using Windows, Mac, or whatever, you can always use this just fine, even through the browser. You don't have to have it installed. My first question regarding usability would be, from your perspective, is this mock-up, this app, well designed from a practical perspective? So, you were able to get along with it well. Is it practically designed for you? Is it usable from your perspective for actual use from a design perspective?

IP3 [00:01:09] Yes, so I got used to it relatively quickly, and I find that certain elements are also in the places that you're used to from other tools, from other website testing tools, or similar. So, because of that, I found it relatively easy to use.

I. [00:01:24] I'm glad to hear that, yes. So, I've also seen, based on your results, I've just skimmed this now. That's why there's only one question about usability. That would be it because the rest I do quantitatively via the survey. And that is a recognized usability test with various parameters, where you can then click on the left-right, which you also did. And I think one point is the degree of innovation. The mock-up is, of course, now very much based on the tools that also exist, for example, on Similarweb for SEO optimization or similar tools, just for a different topic, namely sensory communication in the e-commerce domain. So again, it is more specific to my object of investigation, and so is the thought behind it.

IP3 [00:02:14] Yeah, all right. I understood that, and I think that's good.

I. [00:02:15] All right, in conclusion, you would confirm that the usability and the design are basically understandable and that people would be fine with it.

IP3 [00:02:22] Yes, absolutely.

I. [00:02:23] Okay, the next question is regarding the information content. How would you rate the specific sensory marketing information shown there yourself? Are they satisfactory to you, meeting your expectations, if you have specific ones? In particular, would it meet your expectations if you now spontaneously use such a tool meant for sensory optimization of e-commerce content?

IP3 [00:02:51] I think so. On the one hand, you have the overview, and right at the front, you have the rating and recommendations for each area. So, I mean, of course, you don't have any expectations because you don't know any comparable tools, so it's a bit difficult at this point. But I think that it already reflects what I would expect from a tool on the subject.

I. [00:03:13] Great. That means you also went to the individual elements, for example?

IP3 [00:03:18] Yeah, that's right.

I. [00:03:18] I have that organized by the website elements, such as images and text. And so on. And then, if you click on it, you'll find Nespresso recommendations and the actual status, of course, for this specific example, based on which the recommendation is made.

IP3 [00:03:35] Yes, I think that's very well designed the way it is.

I. [00:03:38] Okay, very good. So, from your point of view, is there still a certain information content that is missing? Is there anything that you're missing? In that regard.

IP3 [00:03:52] No, not really. I haven't noticed anything that I would still be missing currently.

I. [00:03:57] Are certain contents superfluous for you? Or are they all useful in that sense?

IP3 [00:04:09] No, I think they're all useful at first. You also address different target groups different people. And maybe one person doesn't really go into depth and is more superficially interested, but I would offer all the information.

I. [00:04:22] Okay, so there is not too much information.

IP3 [00:04:25] No, already everything that's there now. I wouldn't offer less now. Exactly. But I think it's perfectly fine the way it is now.

I. [00:04:35] Okay, so everybody could pull out what they need from that point of view.

IP3 [00:04:38] Right. Yes.

I. [00:04:40] Okay. Good, then we can move on to the aspect of comparability. That was actually another point that emerged in the first interviews. That means it's always important to understand where you are in the ranking compared to the relevant competition in the respective industry. Of course, market definition plays a role here. In the mock-up, I selected this in advance using the example of Nespresso with the food industry or with the coffee market, i.e., with coffee in the online sector. And how do you find the function? There is a tab with benchmarking, where you can see how you stand in relation to the relevant competition in terms of the sensory consumer approach.

IP3 [00:05:38] I think the overview is pretty good. So, once the general index is on the right side and then again per human sense, so to speak. I think it's kept simple, but it definitely expresses what it's supposed to say.

I. [00:05:52] All right, okay. Are there certain things in that area that you particularly liked and some that you didn't like as much or that you also think are superfluous?

IP3 [00:06:06] So I think that's really to the point, and there's nothing superfluous, and there's nothing missing. It's really to the point. That fits for me.

I. [00:06:13] Could you imagine there's more detail there? I mean, you said it's to the point. Could it be that there's more information needed for some that the tool doesn't give right now?

IP3 [00:06:26] So you could also enter the other companies' websites into the tool, and then you would know in detail where they are better or worse. So, I think that at first glance, it's enough to have the values and to be able to compare based on the values. If you want more information, I would enter the URL in the tool and then see at which specific point they are better and where you want to improve.

I. [00:06:53] I hadn't thought of that just now. I was thinking, how do you do that? Because I do have data available. However, creating an interactive dashboard with different data is even more difficult. There are also tools for that, for example, Qliksense or Tableau. But they are even more complicated than Figma because then you still have to design that and at the same time store the data that you can select and so on. But you are absolutely right. Of course, the idea is to pass the tool on to development at some point later. So you could say that at that point, at least my work stops, that is, my dissertation project. In a way, based on a determined need of experts, the tool is the basis to set up a live dashboard with it at the end. In this specific area in particular, since sensor technology in the online area cannot be addressed in the same way as offline, one could look at what can at least be optimized.

IP3 [00:08:06] Yeah, exactly, that's my understanding as well.

I. [00:08:10] From your point of view, are there any other aspects that we haven't mentioned yet? If you now recapitulate how you clicked through the mock-up and what content you saw? Are there certain things that we haven't talked about yet but that you think are very important for a sensory evaluation?

IP3 [00:08:38] I'm looking again right now. I don't know if dividing into "this could be optimized" would be realistic" and "this needs to be optimized." So, to put such an urgency still behind the recommendation that really just quite "bad" is identified on the website or it's something that's still just acceptable. In this respect, I would integrate an urgency rating.

I. [00:08:59] Okay, it's good that you mention that because it doesn't seem to stand out strongly enough. Currently, there is actually already an integrated urgency notice in the form of a priority indication for the individual recommendations, structured according to the various media. There, you see, for example, a maximum of three icons displayed as squares. And that should represent the priority. In addition, there is a colored indication, for example, in red, for urgent recommendations for sensory communication changes. But do you mean that it should be even more conspicuous and, for example, light up red?

IP3 [00:09:24] Yeah, okay, but that priority then only applies to the whole text area, doesn't it? I.e., not per individual recommendation, right?

I. [00:09:32] Right.

IP3 [00:09:34] Okay, because that would have been more my point now, that at the point that you're making, that there's also prioritized again how important it would be to implement that one point.

I. [00:09:46] Okay, I see. So again, below the text area, one priority per individual recommendation.

IP3 [00:09:55] Right, you could still do that now. To show that specifically. Suppose you start now as a company with the optimization in the area of sensory marketing. In that case, you have a list that includes what you have to tackle first and which aspects do not have such a high priority but could still be optimized so that you have a schedule or something similar, where you can shimmy along what would now be relevant to undertake first and what you can push further.

I. [00:10:21] You mean some kind of work plan that you can work off of based on the recommendations with a level of urgency, right?

IP3 [00:10:26] Exactly, with the result from the tool, some users may still not know exactly enough about what to start with now, what would be the most important thing.

I. [00:10:33] I think that's very good. Okay. Are there any particular aspects now? Generally speaking, this time is based on the mock-up you particularly liked.

IP3 [00:10:49] That's a good question. I actually like it very much in the overall presentation. But I can't even limit that to one point right now.

I. [00:11:01] So, is there anything that you didn't like?

IP3 [00:11:08] I'm just scrolling through the mock-up again. No, but actually, I think everything is really very coherent, and maybe it will come out a little bit when it's really an interactive tool that you can scroll through and move around. Maybe you'll think at another point that, e.g., the button is somehow strange, or you imagine certain aspects differently in detail. But this is a bit difficult in the current, still somewhat static version. For now, I can't think of anything that I didn't like.

I. [00:11:33] I'm glad, but of course, negative feedback is also valuable for me and will be taken into account. In Figma, for example, when you jump from page to page, I only noticed afterward that whenever you're on position X on the page and jump to another page using a button, you don't end up on top but also on this position. I still haven't managed to do that in the tool, so it's due to the mock-up that it's like that and would be better solved in the finished live version of the dashboard.

IP3 [00:12:12] Exactly, it wouldn't be like that in a real application then. I had already thought about that, and I didn't think that was a bad thing.

I. [00:12:16] All right. Okay, then, I would have a couple of other questions. One is in terms of business impact. How would you see the potential impact of this user software on the business sector if you had to rate that now, for example, as a percentage? So, purely what your gut tells you now, just a number. What do you think you could generate in terms of additional sales if you applied the tool and its recommendations stringently?

IP3 [00:13:04] Difficult question. Let me think about that for a second.

I. [00:13:06] Yeah, that's a difficult question. That's why I also looked at reference values of other, already established tools like Similarweb, and I can also give you, for example, the value range between 0 to 15% sales increase. That's a value range that I can give you as a reference. What would you estimate in %?

IP3 [00:13:34] So between zero and 100%, so to speak, how much would it bring?

I. [00:13:39] Exactly. Just in % your spontaneous assessment.

IP3 [00:13:52] Yes, but I can imagine it is in the range of 15%. So, decisions are made subconsciously, and if you follow these recommendations and optimize your website this way, I believe this could affect sales and increase it.

I. [00:14:10] So you would already assume that range of values?

IP3 [00:14:14] Yes.

I. [00:14:15] Okay, good. From your point of view, have we forgotten anything else that comes to your mind now spontaneously about today's topic and the mock-up?

IP3 [00:14:27] No. In fact, no.

I. [00:14:28] Okay, so I'll just have to share my screen in conclusion. By the way, here you can see the whole tool again. Interestingly, if you click on prototype here now, you'll see what you've basically linked. This is what it looks like, so you can jump from page to page and from button to button.

IP3 [00:15:20] Awesome. That's right, our website at work is also neatly linked, and that's a lot of work. But the view in Figma really sums it up, of course.

I. [00:15:32] Right, that's not really what I was getting at. I just happened to still have the program open. I actually brought a few more questions as a self-assessment about yourself. I would like to go through a few more statements with you and ask you for your spontaneous evaluation. You can see the first five statements here on a Likert scale from one to five. Agree completely as one and disagree at all as five. Okay, then, to the first question: Are you a marketing expert - how would you rate yourself?

IP3 [00:16:55] I would give myself a two here (agree).

I. [00:16:58] Okay. Are you an expert in the field of sensory marketing?

IP3 [00:17:05] I would take the three there (neutral).

I. [00:17:12] Are you an expert in web design/digital media?

IP3 [00:17:17] Would I also take two (agree).

I. [00:17:21] Are you an expert in eCommerce?

IP3 [00:17:25] Since also the three (neutral).

I. [00:17:28] And the following question/statement is very broad. In terms of marketing analytics, SEO/SEA/campaign management. Are you an expert in that area?

IP3 [00:17:39] Would I also take the two (agree).

I. [00:17:41] Okay, then finally - but this time in school grades. If you had to rate in-school grades, how would you rate the general solution (i.e., the app) now? So, the solution presented to you for evaluating sensory marketing in e-commerce.

IP3 [00:18:20] I would actually give this an A (very good).

I. [00:18:29] Finally, the question: You are now very close to my dissertation topic through two interviews. How would you evaluate your expertise in this area now?

IP3 [00:18:49] I would take the three there (satisfactory).

I. [00:18:51] Okay. All right. All right. That would be it, actually. That's all I even brought with me. You see, this is actually relatively quick.

I. [00:19:55] But thank you very much for your answers to this and, of course, to the other questions. At this point, I can definitely end the interview.

IP3 [00:20:12] Of course, I'd love to.

- End of Interview -

Appendix 22. Interview IP4 for second SSI

I. [00:00:02] Okay. So, thank you again for taking part in the second interview. The interview today is structured, so I would like to talk to you primarily about the app, as I mentioned earlier. But I would like to say directly that an app does not mean that it really has to be a mobile app. It should rather mean an application in the direction of general software, similar to similar web or other tools, which can also be accessed via the desktop variant. And I also use the terms app or mock-up synonymously. I always mean the same thing, namely what I have laid out in the design tool Figma and built as a click dummy. That's what it's supposed to be about, and I brought up a few questions based on the initial interviews. From these, categories have formed, according to which the whole tool will ultimately be evaluated. First, there would be a question about usability, then about the information content, about comparability, and finally about the financial aspect. And I'll come to the individual topics in a moment. But maybe briefly about yourself. We last spoke about a year ago. Has anything changed in your professional perspective since then that I should include in your CV?

IP4 [00:01:45] Since the last time? Everything has remained the same.

I. [00:01:49] Okay, so same employer, same field of activity, but with the exception that you have now finished the master's degree in marketing except for the thesis and will probably also write it on the topic of e-commerce, right?

IP4 [00:02:09] Exactly, the thesis will also be thematically focused on the e-commerce sector.

I. [00:02:13] Very good. Okay, let's jump right in then. So, you've clicked through the tool, I assume, and also answered the questionnaire. So, I just have one question about usability. And that would be if you had to evaluate this mock-up now or specifically answer whether it is well designed from a practical point of view. What would you say? In particular, if you imagine using it in a business setting, is it efficiently designed from a usability perspective?

IP4 [00:02:59] In principle, yes. So, especially if you look at the dashboard with the overview, with the individual points, I just think it could be compressed a little bit because the information is currently really just all on one page, I say, "written down" in quotation marks. So just that you subdivide everything, of course, according to the individual senses, but that you could just compress a bit better, maybe with sliders or something, gain a more distinct perspective, and concentrate better on individual points than is currently possible, I say, to have a block. So, it's not a block, of course, but it feels exactly like that. That would actually be my main criticism of the usability now if you look at the numbers or the usability, especially the report.

I. [00:04:03] Okay, all right. So also, absolutely legitimate and good feedback. And that's really what the question is aimed at as well because the other questions are to pick up on the other issues. So, then, we're already moving away from usability. If you think of anything else, feel free to add it later at the end. The next aspect would be the information content. And that is, is the information content / the specific information you get displayed there about sensory marketing in the online area in line with your expectations?

IP4 [00:04:51] Mhh, I find it, so when you land on the homepage or front page now, it's too little information. So, especially on the front page. That is then, of course, supplemented by the blog posts. But there, I find it somewhat difficult again because one must read then naturally only depending upon previous knowledge of the Blog to have a better overview. So, I think there could be a bit more content or more depth really on the front page. Because there is indeed something described, but I say times, if one now really comes in there without prior knowledge, then it is just difficult because you would have to read through the blog to understand what it's about.

I. [00:05:47] Yeah, I like that comment. So, it's also what has been reflected back to me elsewhere. Basically, you should make it more tangible for someone who is not as close to the subject now as you are, correct?

IP4 [00:06:06] Exactly. That's what I mean.

I. [00:06:08] Okay, so that means that the information you are currently still missing would be more background information for the practical users and to explain to them even more what it actually is and what it brings, right?

IP4 [00:06:24] Yes, exactly. Because I think the topic is, if you don't know it, you don't know it. But it is actually, if you explain it in a few words to everyone, relatively simple to explain, and each person understands it actually relatively quickly and easily. And such a small contribution is exactly what is still missing there. So, in that sense, it is a complex topic, but from the basic principle, it is relatively simple to explain briefly what it is all about. This should be added.

I. [00:06:59] With these exceptions that you mentioned, do you think it's basically good though?

IP4 [00:07:08] Yes, yes, definitely.

I. [00:07:12] Okay, so do you find that some of the information is perhaps superfluous as well?

IP4 [00:07:21] Yes and no. I don't find anything really superfluous. So, of course, if you look at the information above, for example, the number of employees, the turnover, the industry, the company data. Of course, you could say that this is perhaps superfluous, but I don't think it's superfluous in the sense that it's good to have. So, above all, if you then compare several sites or several companies to have this data, then also compare a bit. Okay, maybe larger companies are better positioned or, the other way around, smaller companies. So maybe at first glance, this data doesn't have anything to do with multisensory communication, but maybe at second glance, it does because I think it's still quite good for comparison. What I missed a little bit - even though it is mentioned quite easily - is a weighting. By that, I mean prioritization, so perhaps it's a bit easier to show the user what's important to you or the company. Here, I'm looking primarily at corporate aspects such as time aspects or prioritization of topics due to limited resources. Of course, as a company, you also have to look at what to do first. First, write the texts, the images, or first the video files. In the case of the recommendations, I think only one small point is mentioned, which impact this has in this industry. Perhaps we could go into more detail about the individual indicators and the priority.

I. [00:09:03] You mean like a kind of work list that you could then work through in order of priority?

IP4 [00:09:06] Yeah, exactly, exactly that. That you say, okay, these points have the biggest impact, that's where you should go first. The other points after that are not equally important but could still be adjusted. You can simply see better as a user what is now important for you to change or adjust as quickly as possible. Exactly.

I. [00:09:23] All right. Okay, then the next criterion would be comparability. Here, the question is basically the same. This is aimed at the extra slide of benchmarking. Assuming you would want to compare yourself just from a sensory point of view with the relevant competition, is what you get displayed in the app your expectations accordingly?

IP4 [00:09:55] Partly partly. I think the points that are there are good. But I would still partly replace those with the points you see on the dashboard. So, it's now specifically about aspects like the text data/images, etc., so these statistical values, how much text the others have, and what images the others have.

I. [00:10:17] So, would you still integrate the details of your own and the other websites here?

IP4 [00:10:19] Exactly, that you can take a cue from that and look at how much and what text, for example, the company ranking number one has integrated on their website. What exactly are the other competitors using? How many images, how much other content, and in what form so that you can also orient yourself a bit? This data is currently only stored in the dashboard, but integrating it into the comparability and benchmarking makes sense, in my opinion. I think that would be quite good.

I. [00:10:52] Okay. So, are there any particular things? You probably just answered the question now that you would like to compare.

IP4 [00:11:01] Yeah, that's right, I actually just answered that.

I. [00:11:04] Then we can skip that. Okay. So, are there any other aspects that we haven't mentioned so far but that you think are essential for a useful evaluation of the sensory area in e-commerce? So, you have a lot of background knowledge on this already. Are there things that you would be missing now in an ad hoc way?

IP4 [00:11:36] Yes, I don't know how to implement that technically. I'm just going to assume that that's possible. Therefore, the following is just a small interjection from me. It has less to do with the content, i.e., the sensory communication, but more with the to-do list I just mentioned. You might also work with links or examples to make it easier for the user to understand the recommendations on their own page. Currently, it basically displays which indicators are missing or can be improved, and then there is a recommendation next to it. I would suggest that you somehow also show where exactly this could be found and changed on the website or on which pages there is still nothing sensory.

I. [00:12:24] So you mean that on the particular page of the customer or, let's say, on the basis of the URL that was entered, you also get displayed there exactly where on the page indicator could be found and possibly optimized, right?

IP4 [00:12:34] Right. Exactly. But I can imagine that companies there, of course, have hundreds of thousands of pages, especially in eCommerce. And even in my analysis at the time, I saw that sometimes a brand or a company has different product pages. It could be that a certain product page would get a very good OSMI rating, and another one would get a worse one, and then you would have to go through it manually, which would, of course, take a lot of time and effort. If you could somehow technically implement that, that you say, okay, here are the pages that really just have this worse rating, that you then also really show them and can directly simply edit.

I. [00:13:20] Okay, then just a few final questions. If you recap now, what did you like best, and what did you like less?

IP4 [00:13:41] Good point. Let me think about that for a second. In general, I think it's good that you show the individual aspects of OSMI so that you really also split that into the individual senses and also the individual subcategories and, as I said, also work with the weighting and also show what exactly has to be done now at all or what is meant by that. This is, I think, quite good, especially for people with or without experience. Especially because you probably won't know the complete list by heart. This is very well structured and really beginner friendly, I call it, or rather user friendly. You can see directly what needs to be done or what could be done, just in terms of content. And as I said, my first point was what I didn't like as much. I mentioned it at the beginning. For me, the page seems a bit too cluttered because everything is concentrated in one spot. Here, you could simply present the information structurally a bit better so that you are not overloaded with all the details, which is good, but if you have, of course, 30 details at once, you could also be a bit overwhelmed. Then you have the possible sensory overload or information overload on your own side, and we don't want that (laughter).

I. [00:15:25] (laughter). All right, and then we'll move mentally away from the mock-up and to the last aspect, which is the financial area. I would still be interested in one question: if you now really had to judge from your gut feeling or had to give an estimate, what it could bring if one would use such a tool in practice and that gladly in percent. Here, I always give a range of values as a reference value that can be anticipated on average across various studies, and that would be a range of values of up to 15%. What would you say now if you look at this tool in a then, of course, again optimized version for the daily user? From your point of view, what impact could this have spontaneously in percentage terms?

I. [00:16:46] Yes, spontaneously, before you even mentioned the reference value, which I thought was kind of low in parts, I would have now expected something like a 10% to 20% range. That's what I had thought. Of course, it depends on the actual situation of the object of investigation. So, it depends on whether you start from a rather chaotic and unorganized page, a page that is not optimized, to a page that is already perfectly sensory optimized. So that's what I'm assuming now. In addition, I would see there already 10 to 20%, even if perhaps 20% could occur rather more rarely. Between 10 and 15%, however, I would already put at least.

I. [00:17:31] From your point of view, are there any other financial aspects that could be affected by using such a tool? So, I'll give you an example: the efficiency in marketing/web design or the return rate. Are these aspects for you? Maybe you have others that you can think of that could be affected.

IP4 [00:17:57] Hmm, yeah, of course. So, sure, the ones you just mentioned, definitely. So, resource-wise, in particular. Especially if we assume now, as I said earlier, that the tool really shows you everything perfectly, then, of course, it's very efficient for the company to edit the content, find it first, and analyze it. Of course, editing would then be the second step. In any case, this involves a lot of working time and, of course, corresponding wages. However, there are also the financial points, as just partly already mentioned, naturally increased conversions, hopefully, longer retention period, perhaps also simply a better connection to the brand, because one can identify oneself then also better with it, if one is more convinced of the texts or with the occurrence. Which, of course, can, in turn, lead to an increased purchase. Against this background, and especially with products such as clothing, a good description plays an important role, which hopefully also reduces the return rate by formulating more clearly what the customer is getting into. I.e., generally, means with products that you rather have to touch before buying, so haptic items.

I. [00:19:30] Well, that's quite a bit of what you said. Okay. So, then, I would actually just conclude with a quick quantitative thing. I brought something else with me. I'll show that right away; I just have to share my screen. But is there anything else we forgot or anything else you want to add on any topic?

IP4 [00:19:52] Wait a minute, I had made my little list. But actually, I've worked through all my points, so I don't really have anything to add. So, at the beginning, I might not have mentioned: I think it's good that there's a blog integrated into the tool so that you can explain why the sub-aspects of sensory marketing are important in the online sector.

I. [00:20:14] Very good. I had already made a note to put this content in compressed form on the start page. I've already taken that with me because you quickly get lost in the details, even when creating such a tool. And it's always a hurdle when you're planning to roll out something like this to the general public at some point. Possibly even. Then, it is even more important to make the whole thing understandable and quickly comprehensible for an audience not so well versed in this topic. Absolutely okay, then that would be it on my specific questions. I have a little add-on with me, and I want to briefly show that to you. My final request would be to walk together once through the statements you are seeing right now that relate to you as a person. I would ask you to self-assess your knowledge/expertise in each area. For the first five statements, please rate yourself on a Likert scale from one to five; for the last two statements, you would rate yourself in school grades, from one to six in the German school grading system. The one would be the best, the six the worst. Okay, so let's like get started. The first statement would be: Are you a marketing expert?

IP4 [00:22:37] Yeah, I would take a one there; I strongly agree.

I. [00:22:43] Are you an expert in sensory marketing?

IP4 [00:22:47] I would say a 2, agree.

I. [00:22:53] Then, you are an expert in web design / digital media? That, of course, is a broad spectrum. I've tried to map that out.

IP4 [00:23:05] Yeah, that's a little bit difficult. For web design, I would say no, but for digital media, I would say yes. Maybe more of a three, then neutral. I'm sure it always depends from case to case.

I. [00:23:24] Then the same question about eCommerce. Are you an expert here?

IP4 [00:23:27] Yes, two, agree.

I. [00:23:31] And again, relatively broad: I called it marketing analytics now, but there's really a lot that falls under it that I probably don't have in here either, but for example, SEO, SEA, campaign management, all of that. Are you an expert here?

IP4 [00:23:47] Yes, yes, I would actually even take one there; I strongly agree.

I. [00:23:52] Then the last two statements would be in the school grading system. How would you rate the solution currently presented? In terms of the original problem addressed, that is, the evaluation of sensory content on e-commerce platforms and its presentation and, ultimately, evaluation?

IP4 [00:24:24] Yeah, I think a two is good. We did have some points that could be improved.

I. [00:24:33] Then, finally, a combined view of your expertise now, specifically in my dissertation project. That is sensory marketing and eCommerce in combination. How would you rate yourself in school grades?

IP4 [00:25:04] Yeah, that's going to be a little bit more difficult. On one hand, I would take a one, but I just don't actively do it, so it's a little bit problematic. I mean, I would say that I know my way around. So maybe it would be more of a two, then, good.

I. [00:25:26] All right, then I actually really have everything I need. Thank you very much for your participation again and the detailed, constructive answers.

- End of Interview -

Appendix 23. Interview IP5 for second SSI

I. [00:00:03] Thank you very much for your willingness to do a second expert interview. So, what should today be about? I've broken the interview down into four subsections. Three of them came from the first interviews and formed categories during the analysis. Namely, one is usability, meaning the design of this app. I would like to ask you something about that. Then, the information content, then the comparability, especially with other companies, i.e., the competition, and the financial impact this tool could have. But I'll come to that in a moment. And last but not least, I've also brought up a few questions about your expertise. Okay, then, I would like to start directly with the first question. When you look at this mock-up/app - I'm using that synonymously - in Figma and click through, how would you judge that in terms of design? Does it meet your expectations, and is it usable from your perspective? Would it be applicable in a business setting, especially from a usability standpoint?

IP5 [00:01:22] Absolutely. So, when I saw that, I was very pleasantly surprised, because I could have imagined it just like that. And I find top, actually. Not only actually, but I think top!

I. [00:01:35] Very good; of course, the mock-up has been created within the scope of possibilities and so far, built up in the Figma design tool as a click dummy; in a live version, that would be more interactive again. But to imagine that you can also click through, this is, from my point of view, already a good approach.

IP5 [00:02:05] Okay, very briefly. Can I ask you a couple of questions? Did you build this yourself?

I. [00:02:09] Yes, exactly. I created that myself in the program. I can show it to you briefly. I'll just share my screen.

IP5 [00:02:16] Sure, I'd love to. I'm quite familiar with user experience and also with building mock-ups, but your suggestion already looks very good.

I. [00:02:24] Great, so did you know the tool Figma before?

IP5 [00:02:28] Yeah, right, you could have called me on it. Sure, it's too late now. But you built it up well without me (laughter).

I. [00:02:38] So I didn't know the tool before, but here you can see the overview of the mock-up with the individual frames. All the ones that you can click through now.

IP5 [00:02:53] Yes, exactly. I know the display; it's very typical of the program.

I. [00:02:53] This probably won't come across to you on your PC, but you can switch here from the "Design" tab to "Prototype," and if I click on it now, then you can see a little bit schematically how many links there are in the entire mock-up. You can see how complex it is to develop such a mock-up and, of course, later, a functional application. In the meantime, I can handle the program quite well, but it was a bit of work to get used to it.

IP5 [00:03:18] Yeah, I believe that.

I. [00:03:20] But it's nice that you know the program itself.

IP5 [00:03:21] Right, I know that as well that you have to deposit all kinds of interactions there, and I can very well imagine how much time goes into that.

I. [00:03:24] Exactly. But to visualize a concept like mine, I think it's very good. So you would say, in conclusion to the question, if there was something like this in reality, would it be useful from a user experience perspective?

IP5 [00:03:40] Yeah, definitely.

I. [00:03:41] Okay. The second question would fall into the area of information content. Is the specific information that you can take from the mock-up there about the sensory communication quality of a website according to your expectations? So, you should have expectations or not. Would you also expect this information spontaneously under certain circumstances?

IP5 [00:04:22] Yes, if I would expect it spontaneously, and if I haven't actively dealt with it before, then definitely. But I think the very first thing I would want to know is what the tool does for me. I mean, you put that in the blog as well. Um, but maybe just at the beginning to integrate key facts again, the tool could still improve. By that, I mean information such as "This can increase that, and this can make that better" - in other words, to explain briefly and succinctly what really brings more sense to address.

I. [00:04:53] Okay, that's a very good point. So, from your point of view, is there any superfluous information?

IP5 [00:05:06] I'll just click through there again a little bit in parallel. I was still wondering - again, very briefly on another thing - what the OSMI rating is measured against. So, for example, evaluations like presented 0/3, etc. I am in the "Sensory Texts" section here right now. Does the ranking mean that a quantity is measured with the three, i.e., the element was used thrice on the e-commerce page, or how is the ranking structured?

I. [00:05:36] Oh, I understand your approach. No, it wouldn't be interpreted that way. Three is sort of a score that the website can achieve in that sensory indicator. That's the way it's meant to be. Based on that, an average score is then calculated at the end. This is then the overall sensory communication behavior score of the website.

IP5 [00:05:56] Ah, ok, now I see that also with the data in Weak / Standard / Good & Excellent. Okay, got it.

I. [00:05:59] Exactly. Yes, and that, again, is based on scientific evidence.

IP5 [00:06:05] Ah, okay.

I. [00:06:05] So that's what's behind it. But clearly, this assessment, these individual steps and indicator expressions 1/2/3, for example, are not arbitrary. But it was designed by me in that way based on the scientific findings and considering similar indices for other circumstances.

IP5 [00:06:21] Okay. Great, I see.

I. [00:06:21] And that's up for discussion, of course. There might be other people who might do it differently. My way, my proposal with the OSMI I have published in the meantime also in a paper. So, it is and remains a hypothetical index like many other values. And if you now go to similarweb.com, for example, or to

seoptimer.com. These tools depict your SEO results in American school grades A plus, A, B, etc. Here, too, of course, is the question of what these tools now ultimately measure this school grade that you have achieved. You have to choose a pragmatic approach, and that is the basis. But it's good that you asked about the value ranges from 0 to 3. As I said, this doesn't stand for the number, but whether you have used the sensory element of this indicator in principle, for example, an active haptic consumer approach, or whether you simply use certain keywords or don't address any senses at all on a textual basis.

IP5 [00:07:21] All right, that makes sense.

I. [00:07:22] Exactly, that's the idea. And then you just get the appropriate rating for it.

IP5 [00:07:29] Now, I don't have your question in mind because we've drifted a little bit. What was your question again?

I. [00:07:32] It was about information behavior and whether the sensory information provided is okay for you.

IP5 [00:07:37] Yes, definitely with the by-product of just now.

I. [00:07:37] You said you would like to have more information beforehand about the benefits of getting involved with sensory communication on the web. I totally agree with you on that. You could add more to that. It's already in the blog posts you mentioned, but it still needs to be integrated more pragmatically on the landing page.

IP5 [00:08:03] Yes, exactly, that's what I would suggest, to make it more quickly understood by the broader community.

I. [00:08:03] Okay, then additionally, my question was if any information is redundant or too much in your view. How do you see that?

IP5 [00:08:11] Not from my point of view. There's nothing specifically that I've noticed now that I find too much or too little in terms of information content.

I. [00:08:15] Okay, so let's move on to the next aspect, which is comparability in terms of relevant competition. That was a point from the initial discussions, and this feature of industry comparability was found to be important and desirable. There is a "Benchmarking" tab in the tool. What do you think of it? Does it meet your expectations when you want to compare yourself with your relevant competition in terms of sensory marketing in e-commerce?

IP5 [00:08:46] Yes, I think that's absolutely successful.

I. [00:08:50] I'm glad to hear that.

IP5 [00:08:53] I don't see what I'm missing in terms of information. Perhaps it just occurred to me concrete examples could be added, just as you, if I now go back to the area of "Sensory Text Content," already explain concrete examples in the dashboard of what can be done better. And then maybe concrete examples from other companies of how they do it, i.e., how they copy-paste the text lines so that you can point to them and compare them better.

I. [00:09:23] Yeah, okay. That's an important point. Others have said that as well. It's very, very aggregated. It's also deliberately done that way for now because the further information, of course, you could pull that in a functioning tool, where you enter the respective competitor's website and then compare. But you're absolutely right; I agree with you. You could still combine that to make it more comfortable.

IP5 [00:09:49] Yeah, right, that would be a good add-on option and would make it even more efficient.

I. [00:10:08] But good. Yes. So, I'm happy that the benefit of the comparability fits in principle for you. Okay, are there any other aspects related to the tool that we haven't mentioned yet but that you think would be important in terms of sensory marketing in the online space that this tool might not map yet?

IP5 [00:10:32] Um, yeah. The main aspect is, I think, the possibility of tracking. So, how can I really tell what has made me use certain sensory keywords or other sensory content? Are they really reflected in buying behavior? That's difficult to track, of course, but you somehow still develop a measurement or a scale or something that you can really also track that the customization had an effect. Do you know what I'm getting at?

I. [00:11:08] Yeah, sure. But that's actually relatively difficult to include here. I'm thinking in parallel whether other such dashboards include that or not. I'll have to take a look at that.

IP5 [00:11:27] A mundane thought I had about this would be as follows. Assuming an e-commerce website applies the OSMI tool, then, of course, you could work with a popup, with the question to the visitor, "How do you find this, and this presented?". So that consumers are really asked while browsing. Then, post-purchase, they are asked why they decided to buy on that website and whether sensory marketing, for example, influenced that.

I. [00:11:52] Ah, okay, that's an important aspect. It would be now from my current point of view rather than Future Research because this is no longer in the main scope of my dissertation project to map because one has first developed the concept and checked whether, with Big Data methods, such an approach could work at all. In fact, the point is then beyond what the use of such a tool really brings. All the experts confirmed to me that the conscious use and coordination of sensory content in the e-commerce sector is important, and of course, this is also in line with existing scientific findings from studies. Various studies have already looked at the practical benefits of individual sensory indicators. But it really is a complex topic, and it will be all the more exciting to investigate the impact as further research with measurements such as you have suggested. But then you would also have to consider that everyone is different, and sensory appeal doesn't work the same for everyone, so generalizing the potential effect might be a bit more difficult after all. As you also mentioned, sensory perception is often subconscious. However, I think it's very good that you address this in particular. I'll definitely take that on board. Yes, so that means you would like to have such an effectiveness evaluation?

IP5 [00:13:00] Yeah, exactly, that's what I came up with.

I. [00:13:00] Okay, I see. Yeah, I really need to think about that. You can derive exciting further studies from this for the future. So, are there aspects that you find particularly good about the tool? Likewise, the other way around. Are there aspects that you don't find so good?

IP5 [00:13:23] I thought the dashboard was particularly good, first of all. So, making the information accessible quickly and concisely. I find it super clear. As I said, I really have nothing to complain about.

I. [00:13:41] Okay, That's enough. All right. Then, we'll move away from the tool. Then, I would like to talk to you briefly about the financial aspect that using such an application similar to similarweb.com, for example, would entail from your point of view. How would you evaluate the potential if you had to relate it in percentage terms to a key performance indicator, e.g., the potential sales effect? So, as a pure number in percentage. How much could this bring if you are dedicated to online sensory marketing and use the tool in a then-functional version? As a reference value, I can gladly give you a value range of 0 to 15%, which can generally be anticipated on average in content optimization.

IP5 [00:14:44] Yeah, I'll think about that for a minute.

I. [00:14:46] You could also take that range of values or, say, a number that is in that range of values or possibly beyond that.

IP5 [00:14:53] I would probably go to 5 to 10% maximum. I'll say I don't know if you can subconsciously influence that much just by writing down or picturing sensorily. But yeah, 5-10% is what I would say here.

I. [00:15:23] So, are there any other financial aspects that you could possibly tangentially affect by using such a sensory-based application? So I'll take an example now: return rate. Is there anything there from your perspective?

IP5 [00:15:43] Absolutely, 100%. Depending on how the images are then also evaluated by the tool, that can definitely reduce the return rate. How often do you have that? And I know this particularly well from my work in textile eCommerce, that people may have imagined something else under the product quality. I think that's very industry-dependent, but in the textile industry, that can be very helpful. Of course, the return rate is probably also higher for textile companies than in the case of Nespresso, for example. If I compare that, when you order capsules, you basically know what you're buying, and it's also a consumer product. But yes, I think that in the textile area, that could definitely have a big financial benefit with regard to reducing the returns rate because haptics, in particular, is one of the most decisive senses, especially in e-commerce.

I. [00:17:06] Exactly. But with Nespresso, for example, you also have the general challenge in the e-commerce coffee industry to convey the different degrees of roast and tastes, also the smell, over the Internet. In other words, you must convey the respective taste as well as possible. Then again, the feel plays less of a role. I absolutely agree with you; the consideration of this has an industry-dependent focus, and each industry has different challenges. Is there anything else you would like to say about the tool in general? Is there anything that we may have forgotten that you can think of spontaneously?

IP5 [00:18:00] I mean, the tool is not yet fully developed. But if that should be the case, maybe a how-to or a guide would be relatively helpful initially, in my opinion. How to use the tool? What do some results mean, for example, in the ranking in detail? Or, you open the app and get a guide via pop-ups that tells you, "Hey, check this first, then this, and here you have the meaning of the current rating so you can get started and optimize your website."

I. [00:18:31] Okay. Very good. All right. Then, that was my last question on the tool. I now have a few more statements about yourself, and I would like you to give me your self-assessment. So, there are now seven statements in total where I would like you to spontaneously give an evaluation. The first five are based on a scale of 1 to 5, where one stands for "completely agree" and five for the opposite. Right. Let's get started. As I said, I like to be spontaneous. In the first statement, how would you see yourself if you're a marketing expert?

IP5 [00:20:10] On a two, I agree.

I. [00:20:15] Are you an expert in sensory marketing?

IP5 [00:20:22] Three, neutral.

I. [00:20:26] Are you an expert in web design? I've now equated that with digital media.

IP5 [00:20:35] A one, strongly agree.

I. [00:20:37] Are you an expert in marketing analytics? By that, I mean SEO/ SEA and campaign management. Everything that goes with it.

IP5 [00:20:50] Four disagree.

I. [00:20:52] Okay. Then, two additional statements, but this time at the school grade level, where one is best, and six is unsatisfactory. In school grade terms, how would you rate the overall solution that was presented? In other words, the app that aims to evaluate sensory marketing in e-commerce. What do you think of the approach?

IP5 [00:21:24] One, very good.

I. [00:21:29] And now that you have ultimately also witnessed my entire dissertation project more extensively again through two interviews, how would you rate your expertise in this specific area?

IP5 [00:21:52] That then relates a little bit to before that question two, right?

I. [00:21:55] Yes, also, among other things.

IP5 [00:21:55] One three.

I. [00:22:04] Yes, great. Of course, that's a very narrow field now, that's clear. And that's why I'm asking specifically in relation to web design, e-commerce, etc. because it's all about picking up people with a tool like this who may not have had much contact with sensory marketing so far. Just for the sake of interest, why do you actually see yourself at a four in web design?

IP5 [00:22:42] Because that's where I've had the least contact with the analytical area in my career so far. And actually, my partners or my employees have always taken care of it. Yes, I was more the creative, implementing part, and others analyzed the numbers.

I. [00:23:07] Okay, I see, but if you were to see a report right now with a lot of numbers and deal with it?IP5 [00:23:14] Yeah, yeah, sure. So, it's more the issue that I haven't done it before, but if I were to look into it, I would be able to pick it up pretty quickly.

I. [00:23:29] Okay. Yeah good. Then, we would be at the end of the interview.

IP5 [00:23:45] All right, I hope I was able to help you.

I. [00:23:53] Yes, definitely. Thank you very, very much for your time and the answers.

- End of Interview -

Appendix 24. Interview IP6 for second SSI

I. [00:00:02] Welcome to the second interview. The second interview now refers to the first interviews and the categories in relation to online sensory marketing, which could be analyzed and formed from them. With regard to my main topic, sensory marketing in the online sector and its evaluation, including recommendations on what could be done better at this point, various aspects have first emerged. On the one hand, it would make sense to develop a kind of application. I have now done this in the sense of a mock-up to illustrate the concept with real results that I could determine. That's what you've already been able to click through. In that regard, one of the first questions would be in terms of usability, and I'll get to that in a minute. Beyond that, there are the issues of information content and comparability. As a last aspect, I would like to talk to you about a possible financial impact, which I would like to address at the end. But maybe first, a quick word about you. We conducted the last interview in March 2022. Has anything changed professionally that I need to update in your key data? I noted that you were still working for a large energy supply company at that time, but at the same time, you were pushing ahead with your self-employment.

IP6 [00:01:43] Right, I recently quit there as well. I'm still within the notice period, but I don't do much there anymore. Then, of course, I still have the marketing side with my agency. However, we are now in the process of closing that down because my cofounders are looking around in another field. I then founded a consulting company out of the agency, i.e., I have reorganized the existing company in the direction of consulting, and I now work very little operationally but a lot strategically. Accordingly, I am no longer active in the field of e-commerce or, website building, or search engine optimization. That means I do more strategic consulting on marketing and website topics. But I don't do anything operationally in that area anymore. That is, it has shifted a bit from agency to strategic consulting.

I. [00:03:03] All right, and the topics such as SEO and content optimization you have already done in the agency time?

IP6 [00:03:06] We actually did search engine optimization in the agency before, built websites, and managed some projects in these areas. That means that you also have the experience. But I'm currently responsible for such topics, if only in an advisory capacity, but no longer operationally.

I. [00:03:26] Yes, really, very, very interesting. Okay, well, then I would move away from your person for a second, but I'll come back to it at the very end. I'd like to talk to you now about the mock-up. By the way, I use that synonymously when I say mock-up, prototype, or app; I mean what I have created in the Figma software. Then also the first short question would be because of your professional background. Do you already know the program? I'll show it to you again briefly, one moment please.

IP6 [00:05:03] No need, I know it, but only by name. I have not yet worked with it myself.

I. [00:05:07] Okay, good. Then my first question would be, in terms of the mock-up that I built as the first version, from your perspective, is it designed in a way that it would be practically usable well? So, whether the usability/design is configured well for a business setting?

IP6 [00:05:37] Of course, this is now a prototype, and I'll be happy to say a few things that can be improved if necessary. But I would say that it is definitely usable in terms of usability and comparable with other tools/apps. Therefore, basically, yes.

I. [00:05:59] All right. But you're welcome to make suggestions for improvement right now, specifically in terms of usability. If you have noticed something that you think is good or that you don't think is good.

IP6 [00:06:14] So, I think we'll certainly go into that in a moment. But very briefly. I mean, this is obviously a mock-up now in the browser version. The structure and the usability of the app itself, in case it's going to be an app, would still have to change a lot. I assume that you will take this into account anyway. So, the structure of an app will be very different from the actual state. You had listed something like "must-have platform" and other sales arguments on the landing page. You wouldn't include that in the app, but it's something like a sales approach that you would primarily communicate on the website. Therefore, it is not the use of the tool itself but rather the first impression of the landing page, which probably does not take place in the same way in the app. There, you probably start directly from the dashboard.

I. [00:07:16] I can absolutely understand your train of thought. I have to say that the primary use of the tool would be intended in a business setting, and most users probably work on a desktop PC with a large screen, with the app only the application / the application is meant. This should not actually be developed as a mobile version for smartphones, etc. So, it is clear that currently no responsivity is stored. But that should follow, and then you could, at least on somewhat larger screens, also use the tool with mobile devices. But as I said, it is currently not planned to design it for smartphones. For that, you have to build a completely new view. That's probably what you mean. The tool currently shows the primary layout for now, which it would keep in a functional version with possibly more features. As you have already said, one or the other content would then also possibly disappear completely because it is then not necessary. This also turns out through the current conversations I'm having.

IP6 [00:08:09] Yes, if we then work specifically, I'll say, with the dashboard, which is then the actual product or the user interface, then I think that the usability is definitely quite successful with the buttons that you have and the overviews and the structure of the data that is ejected.

I. [00:08:31] Okay, by the way, that would be directly the second point, namely the information quality, that is, what you can take from the tool for yourself. Is that according to your expectations that you would have for such a tool? So, regarding information and sensory evaluation of marketing content in the e-commerce space?

IP6 [00:08:59] So I think on this point, first of all, you have to differentiate. So, I wrote down the following earlier when I looked at this. You actually have in the first step the data preparation that you're representing. And

regardless of your product, the subsequent step is to analyze the data preparation. That's basically followed by the indication and potential recommendations for action for the customer. That is, after all, a causality chain that underlies this when I use the tool. Of course, what I'm looking at now is primarily the data preparation. What I would be interested in, when it also comes to the content, would be the recommendation for action. I mean, if now the added value is, for example, to analyze how many images are on the website and what content share that would have, then I could probably also do that manually or take it from already existing tools. Therefore, I think the greatest value is to be found in the insights, and we might come back to that when we talk about the tool and also look at the landing page and things like that, what feedback I have there. Then, the question for me is what happens with the data that is still being processed. That looks cool in the dashboard for now. But for me, as a customer, the much greater value is what optimization suggestions I could take from the tool. As a result, it should be possible to see what I can do with the information, for example, that I have 32% fewer images than others in the same industry and that their SEO is better as a result or similar. That is, to draw this indication and concrete recommendations for action from it. I think that's where the value for the customer or for the users comes from. That's not quite clear to me now because I see, first of all, a data preparation.

I. [00:10:48] I find it very interesting how you systematically analyze that. What you're talking about is actually already included to get a sense of what you could do better in terms of the topic area. The recommendations for action are already included when you look in the dashboard under the heading of sensory content and then click on the individual website elements. Then, a distinction is made between textual content, visual content, audio, video, and interactive content. If you then click on it, the data analysis with supplementary recommendations is formed on the basis of the data preparation.

IP6 [00:11:25] It's these icons here, right?

I. [00:11:26] Yes, exactly. If you then click on it, then you can see what is good from a sensory content perspective or what is not yet good and how you can solve this by indicating the priority, i.e., the urgency. So, these are exactly the recommendations that you meant. They are included in the part.

IP6 [00:11:41] Okay, I hadn't seen that, for example, sorry. I clicked through that in the back. And looking at other analytics in the tool. So, I then basically understood what kind of errors are analyzed and how to improve them. I still do not fully understand how the software works and the analysis then exactly gets there. How it can read that and how this would then look specifically for the customer.

I. [00:12:17] In fact, it would be that the tool shows the final result. Of course, what is all done in the background is based on complex calculation steps. Namely, at the beginning, the desired web page has to be crawled first in order to be able to analyze the data afterward. If the texts contain sensory elements, for example, the text is formulated in such a way that it is truly sensory-responsive. The software in the background would then be based on artificial intelligence as the underlying technology behind it, which is, of course, not presented so transparently

to the user now. Even if I do it from a scientific point of view, you could also imagine that it's comparable to disclosing your business strategy and explaining in detail how it works. That's not the intention at all, but rather to give concrete recommendations and to show what could be improved on the basis of the data found. For example, when you go into the images, you can see that, okay, you could still use images from other perspectives; you could show images that show the capsule size of the coffee or something similar. Right now, in relation to Nespresso. These are the kinds of things that are meant by that.

IP6 [00:13:29] Okay, so it wasn't meant that way either (laughter). I mean, you don't have to show everything how you work and program your program. But assuming that would work so far. What is the objective behind improving the individual indicators? Let's take the first example, "No pictures from different angles." As a recommendation, the tool says that this could be improved, but I don't see the goal behind it. What I have just mentioned, e.g., to add more details on the landing page or in the sales area. What problem of customers does the tool solve? Can you improve the SEO or push sales increase or similar? What exactly is the value of following these steps?

I. [00:14:30] Yes, so the value is multi-faceted, but first and foremost, of course, is an improved user experience for the customer by optimizing the sensory experience on the content side, and this can and should, of course, result in a sales increase. At this point in time, it's not possible to quantify that without various further studies, and that would also be outside the scope of my work, even though it's very interesting. So, there are various publications that prove positive effects on dwell time, bounce rate, etc., for the individual indicators and, thus, ultimately, the sales area. Of course, there are no hard facts, such as if you include certain keywords, you will then be on plate 1 in SEO. You can not say that now, but also many other products, such as similarweb.com, which only give value ranges based on experience, which I could not yet generate with the tool. This should be the content of further research. Nevertheless, all the findings that are included in this mock-up are based on scientific findings that say that if you do it this way and that way, you can actually also have an impact because it just comes to, for example, a longer dwell time on the website, which can correlate positively with purchase completion or a lower bounce rate. That people say, okay, this is more interesting content that appeals to me more. Of course, customers would rarely consciously say that I have to add that. But generally, more sensory appealing content can lead to people automatically looking at it longer than if you subconsciously realize this somehow doesn't fit. Let's say the text on the website is not understandable, that this is not how I imagine it. In terms of the images and so on, that just many things must be in harmony with each other. In the end, of course, it should also have a business impact, but exactly how that turns out and on what scale would then be the starting point for further research steps.

IP6 [00:17:22] All right, I've understood that so far, then it's also conclusive for me. Then, I would just take up exactly that on the landing page again directly in a striking way. Here, I would focus more on the sales approach and customer value.

I. [00:17:39] Okay, so that means those are the things that you're missing. I made a note of that.

IP6 [00:17:41] That's exactly what I would miss in the step before because I don't know exactly what you just explained to me. The benefit should still be included here, that is, to briefly and succinctly present how the user of the tool benefits from the use and which problem is possibly solved. This came a bit short for me now on the landing page, and I think it would make sense, even if you see the automatic analysis afterward. Best add, if the data exists, then the tool can improve sales by, say, 20% and reduce bounce rate by x percent. Then maybe you could also show customer cases on the website that your exemplary e-commerce companies have managed to improve their KPIs. From my point of view, not everything has to be tested in individual studies, but customer cases can also be good references to simply highlight the benefit again.

I. [00:18:49] Yes, okay, very good. That was my question in terms of information quality in general. Then, I would briefly talk to you again about the area of comparability because that was also an important point from the first discussions. There is a tab in the tool called Benchmarking, where, in this specific example, you can see the analysis for Nespresso in the context of other companies. So, where do you actually stand in the market or in the relevant competition? In this context, market definition plays a fundamentally important role. If you now project your expectations with regard to benchmarking and consider whether it meets your expectations, would you say that benchmarking fulfills its purpose? Or would you say that you are still missing something in this context?

IP6 [00:19:49] Exactly. I think it's good that you divide the area again into the five categories, that is, according to the five senses. I think that's very well received to also benchmark on this basis. I also think that's cool because that's, of course, very helpful, especially with this quantification that's backed up with the metrics. I think that the value ranges are perhaps not so interaction-friendly for users. Maybe you can work much cooler with colors or use a different scale or something. I think that would be a bit more interactive. On the other hand, I think that the Word Cloud Chart always looks quite nice, but I wouldn't see that much value in it. Maybe you can tell me briefly what you were thinking?

I. [00:20:38] That's definitely just an add-on for comparability.

IP6 [00:20:40] Okay, then I think you can rather do without it. Other than that, I haven't noticed anything negative that needs improvement. I think the OSMI index is quite cool, and I think it's also helpful. And as I said, I find this benchmarking useful as well. It could maybe be converted into a different scale that's maybe a little bit more interactive or user-friendly. And, of course, what is missing here for me, then again, a little bit, is the data analysis. The data preparation is good, and the analysis is good to some extent, but does that go along with what I said earlier? I would recommend benchmarking, analogous to the dashboard, to include indications and recommendations for action here as well. What are the other competitors perhaps doing better? From my point of view, it would be useful in benchmarking to understand why, for example, Lavazza performs better in some senses. By this, I mean specifically the cases and the practical examples that make up this rating. Why does Lavazza have a score of .51 for haptics and Nespresso a .40? What have they perhaps done better? It could certainly help again to get that exactly pointed out.

I. [00:21:39] Perfect. All right. From your point of view, are there any other aspects that we haven't highlighted or mentioned so far in the area of sensory evaluation of online content or e-commerce content? Is there anything else you can think of off the top of your head? Should the tool still have something in it that has not yet been considered in the mock-up?

IP6 [00:22:05] I'm more of a friend of cutting things down. I think most tools always take on way too much in the beginning. And I think it's better to develop stuff and test it first than to have too much content at the beginning and not know exactly why customers use it or why something doesn't work. That's usually due to too many factors. That's why I'd rather scale it down a little bit, like with the Word Cloud chart, for example. I don't think that brings any customer benefit. My approach would be to really condense the tool again from the customer benefit point of view, and that's why I'm not missing any additional content for the time being.

I. [00:22:37] So which aspect in general of the tool do you like the best or did you like the most, and which one maybe the least? I think you've already mentioned the latter to some extent. Maybe you can summarize again in both directions.

IP6 [00:23:00] Exactly. So, what I like is both in the dashboard and in the benchmarking, the clear analysis that I can just directly see my score when I automatically enter my target URL. I can quickly see in which areas I'm good and where I'm not so good, and then I can also compare that with the competition. Maybe you could even integrate benchmarking into the actual dashboard. You just always put a benchmarking KPI or something next to it. For example, use a light to make it clear, okay, here is your own value, and next to it, a green, yellow, or red light if you are better, equally good, or worse than the competition. Then, you might even have everything at a glance. But that is such a small side note, as I said, if you condense it. But I think it's very cool that I have the index and can briefly see how I rank in all five areas and how the competition ranks. I find that very simple, clear, and appropriate. That's, I think, pretty much the first-level problem that a customer might have. What I currently like less is the second and third levels. That I can't perhaps always see specifically what recommendations for action apply there.

I. [00:24:11] Okay, we just had that, too, that the recommendations for action are already in there. Are you still missing some details?

IP6 [00:24:11] I mean more in the implementation later. I don't know yet exactly how that would work. I'm curious to see what the tool would look like in the end. Not only the analysis but also especially the indication and the recommendations for action in live. Suppose you have no enterprise side with coffee or any products that you had before, perhaps not yet, where new data sets are added. Even if then automated, benchmarks are drawn with companies that may not even be in the industry for the customer or something. I sometimes find it very difficult to automate this because I can imagine that sometimes the human mind is still better. I'm curious to see how the data analysis and indication would work on the second and third levels. I'm still a bit critical there.

I. [00:25:01] Yes, I can understand that. There's definitely still development work to be done, no question. But that will be so that, basically, the concept will be similar to what you might already know from numerous AI tools, which, of course, have to be trained with immense knowledge to then be able to make recommendations based on that. At some point, there could also be a live integration. I'm not talking about integrating something into the OSMI tool, but possibly into those that already exist on the market. You can enter a URL and then be told what you can do better in terms of SEO or online sensory marketing. That may come at some point, of course. You don't know how that will develop, especially with AI-supported programs. Ultimately, however, the data architecture, how the whole thing works and is set up in the back end, would be similar and comparable to what already exists in other areas.

IP6 [00:26:09] Okay. Yes, I've been following the development of known AI tools over the last few years as well. It doesn't happen overnight. I'm always a bit cautious about something like that because it's nice when the technology can do everything, but you have to get that implemented first. So, it's certainly feasible if you have the resources, both financially and in terms of personnel. But it is, of course, a wish for the future. At the moment, as I said, I believe that if you want to implement it, you have to do it well. Well prepared for the user.

I. [00:26:47] I agree with you on that. Checking whether it would be possible in principle to build such a tool based on Big Data methods would be possible per se. In that respect, my research has already shown that. The mock-up here is a first impulse and a check-up whether it meets the previously identified need. Okay, then, we have already reached the last questions. This time, however, it is about business impact. And we've touched on this area as well, I must say. But my two specific questions would be as follows. If you now assume that a customer of yours says that he would like to have a sensory evaluation, how would you estimate the potential business impact? A rough estimate is perfectly sufficient for me. For established websites with similar objectives, a sales impact of up to 15% can be assumed on average. How would you estimate it here if you had to spontaneously give a figure in percent?

IP6 [00:27:52] Right, now if we just focus on Sales. I think that is the easiest metric to observe in this context. That is, starting from 0% in the case that the tool would have no effect; of course, if it's working well, it could be good that it's also going towards 15%. That could be seen as a benchmark for the time being. Then, of course, you also have the opportunity to reinvest. Especially in e-commerce, sales is one of the most important metrics of all because it finances everything and, at the same time, makes it possible to invest in content, website optimization, products, or marketing performance. Therefore, a sales impact of, let's say, 7.5% is extremely relevant and extremely important. If you look at the e-commerce companies and their sales, you see that they are often in the millions anyway and that these would also be potential users for the tool. Of course, 7% is very good as a rule. So, from there, I would estimate the business impact like this. Or also declare it as a scale from 1 to 10 already in the direction of seven or eight in any case, as far as the significance is concerned.

I. [00:29:24] Okay, do you think, and you've already anticipated it a little bit with the reinvestments that you mentioned, that it can also have other influences? I'm going to say other financial aspects of the business could be tangential, such as the return rate.

IP6 [00:29:51] Absolutely. I think we talked about this in more detail in the first interview. Especially the points about the advantages of sensory marketing and how you can optimize it in e-commerce. Absolutely. The return rate is a topic here. Other metrics like dwell time and website revisits are also important in this, even though they might be more likely to pay into sales in the long run. From a financial perspective, the return rate is, of course, relevant. What does the customer order and what does he return, why does he return something, and how can this be reduced are the typical, important questions for companies. If I have a lower return rate, I probably not only have better content quality but also a better user experience in general, and thus probably also a greater customer lifetime value or reoccurring customers that I can still get as a result. Customer loyalty could also perhaps strengthen this. So, in those directions.

I. [00:30:57] Wonderful. Okay, from your point of view, have we forgotten anything else? Is there anything else off the top of your head that you want to get rid of about this complete topic area? On sensory marketing and the application that I presented? Is there anything else that comes to your mind spontaneously?

IP6 [00:31:14] I don't see the whole thing as an app, I have to say. I don't think I said that in the first interview, either. I find, for one thing, I also have startups that I work with that do apps. You always hear that most Germans only really use their seven to eight apps on a regular basis. And then you download something. And I also have an app from Vodafone for this and that. And at the end of the day, I still go through the browser and just use my couple of apps. That is, I think developing an app is a phenomenon that every company thinks they have to make an app. I actually take a critical view of that.

I. [00:31:52] understand, let me explain briefly. With "app," I may have titled it wrong, especially when we often just use the abbreviation in Germany. But it stands for application, which means software or a tool that could also be integrated into an already existing one. So, as you say, it shouldn't be an app per se because the app is already associated by the wording with a kind of smartphone-based solution or something. This is actually not intended as a primary solution for the B2B sector and not for the end customer. However, the end customer should ultimately benefit from it by improving the customer journey. If it does, it's more likely to become a standalone website, and we'll see what happens at some point. So, in that direction, or as an add-on to an existing software.

IP6 [00:32:31] All right, then I don't have to elaborate on that because I think, especially in the B2B area, where you'll be active, almost everyone uses desktop-based end devices, of course, and smartphones and apps don't make much sense there anyway. Then, of course, the equivalent would be to have your own software. It's a similar story there. Do I build my own application for that? Can I do that browser-based? Can I perhaps use an API? Maybe you go more in that direction after all. Or you can just use your own website, and employees can access

their own dashboard there. We'll have to see. I can also imagine that maybe just an API is useful to distribute it as software as a service. Or whether you do it via your own website with membership. Either way, you have to think about it. I would then be interested in how you monetize it afterward and how it is represented in the business backend.

I. [00:34:30] Okay, very well, those were all my questions about the tool. But I brought a few more statements with me, with the request that you each briefly self-assess. The first five statements are on a scale of one to five, where one stands for agree completely and the five correspondingly for the opposite. The last two questions then refer again basically to the tool and your expertise, but in these cases, then in school grades. Okay, then, to the first statement. Would you describe yourself as a marketing expert?

IP6 [00:35:54] One two, agree.

I. [00:35:54] Are you an expert in sensory marketing?

IP6 [00:36:14] A three, neutral.

I. [00:36:18] Are you an expert in web design/digital media?

IP6 [00:36:34] A two, agree. I'm more versed in digital media, but that fits.

I. [00:36:34] Are you an expert in e-commerce?

IP6 [00:36:35] A three, neutral.

I. [00:36:35] And are you an expert in SEA/SEO/campaign management?

IP6 [00:36:35] Here's a two, agree.

I. [00:36:59] Okay, good. This time, however, please in school grades, where the one stands for very good and the six for very bad. If you had to evaluate the presented solution for the original problem, that is, to evaluate sensory marketing in the e-commerce area, what would you give the whole thing in the current status for a grade?

IP6 [00:37:26] So I think if it's purely about evaluation, you've got it down well in a nice dashboard. So, assuming it all works like that in practice, you can use the dashboard to show quite easily and in a user-friendly way on a scale with a simple metric, whether it's good or not. So, from that point of view, I would consider that pretty successful already. Of course, it still goes beyond that, how I can then work with it in everyday life, and so I can't assess that 100% yet. I would give it a good two.

I. [00:38:06] And now that you have heard a lot about my specific dissertation topic through two expert interviews, how would you assess your expert status in general in this context? Here, for example, it was a question of basically combining sensory marketing, big data, and e-commerce. How would you rate your expertise in school grades?

I. [00:38:37] As three, satisfactory.

I. [00:38:38] One three. Okay, good. All right. Then that would actually be it for that as well, and with that, I wanted to round out the conversation. Thank you very much for your willingness to be interviewed again and for the detailed exchange.

- End of Interview -

Appendix 25. Interview IP7 for second SSI

I. [00:00:03] Welcome to the second interview. Thank you very much for your participation and time; you have now clicked through the mock-up. That's primarily what we're going to be talking about today. As I said, I use the term mock-up synonymously with an app or also prototype in the software Figma. So that's my first question. Do you actually know the software?

IP7 [00:00:23] Yeah, I know it, and we actually work with it as well.

I. [00:00:24] Interesting, then you're probably building frames in there and looking at what that probably looks like in advance, right?

IP7 [00:00:32] Exactly. We have a lot of briefings on new products, and the feedback is collected in Figma. If we already get that in the rough formats, then set there by our creative team.

I. [00:00:47] And then also directly clickable or first only as static?

IP7 [00:00:51] Static. We then put our comments at the point where we want to have an adjustment to the creative, to the key visual, which is then kind of reused very frequently in the particular campaign. That's where adjustments are then made.

I. [00:01:11] Interesting. But nothing has changed in your professional environment since our last interview, has it? Has everything remained the same?

IP7 [00:01:21] Exactly, it's all the same.

I. [00:01:21] Okay, the first interview took place almost a year ago. Okay, then, briefly on the interview procedure. I have four larger chapters if you like, but each does not contain many questions. The four chapters come from the first interviews. After analyzing the first interviews systematically, certain categories crystallized out of them. I can name these categories once. One is usability. The second is information content. So, what does the application offer you purely in terms of information? Then another point was the comparability, especially to the relevant competition. And last but not least, I would also have two questions about a possible financial aspect. Good, then we can start with the first one. Since you have now looked at the tool and clicked through it, my first question would be: Is this mock-up well designed for a business setting from a usability perspective? So, did you get along with it? Is it suitable for daily use on an operational level?

IP7 [00:02:50] Yes. I would say yes because it overwhelms you very quickly, especially in daily business, if you are confronted with too many numbers. I know this very well, at least from my environment, especially when we talk about how we have to deal with it on a daily basis and perhaps also have to report things. You are inundated by a relatively large number of key figures. And it usually takes a very long time to get an overview. So, you can no longer see the forest for the trees. I think that sums it up quite well. That's why I think the downscaling to the most important metrics in the tool is very successful. Enriched then just once again with icons. Everyone learns

differently, of course, but I find it useful because you immediately understand what it's all about without having to think about it. It helps, I think, also in the daily Doing again. And to be able to track things over a longer period without getting lost in it and losing many hours in it. Because the actual work is not in the tool itself, but rather using the tool as assistance alongside the marketing manager, and the tool manages to accomplish that.

I. [00:04:24] You said that really, very well. No one has said it before, but that's exactly how it is, and you get to the point. Great. Okay, then we can go directly to the information content. Because you have now also seen the pages Dashboard, Benchmarking, and so on, is the specific information you get there according to your expectations of such a tool with the headline that you would like sensory marketing here evaluated on your side and also get recommendations?

IP7 [00:05:13] Yes, definitely. So, two things, in particular, are totally important to me. First of all, this topic of going here and not only having a rating but also understanding how this is now composed. So, for example, when we talk about the haptics parameter or other senses, to understand how I am positioned in these individual subcategories, how am I performing on the indicators? Where can I improve and where not? For the person who actually works with the tool at the operational level, in order to be able to create recommendations for action directly from it, to coordinate these with his or her supervisor if necessary, and then actually implement them. And then the second thing you just mentioned comes into play, namely the big question of optimization. Okay, now I understand what is good or bad, but how do I implement it now? And personally, I'm at least someone who always learns easier with an example as well. This example should be as specific as possible. If you don't get a specific example and only learn that, for example, there should be more reviews on the website, then that doesn't help much. Then you are left with questions like what kind of reviews? What should they be based on? Do they have a certain focus? There are, again, so many things you can do wrong or right. If you have a guideline, you can at least orient yourself to it, and perhaps you don't have to be an absolute expert in the subject of sensory communication, but you can already implement everything here relatively quickly in the store as a layman who is responsible for the web store and see how it influences the OSMI score.

I. [00:07:09] All right. From your point of view, is there any information that you are still missing or that is even superfluous?

IP7 [00:07:20] I had seen that you definitely brought pictures in here at one point or another, as an example. I found that very, very helpful because, from my point of view, the classic saying that pictures say more than a thousand words works. That is, I would include pictures wherever possible. I find that totally helpful. For video content, I didn't see an example in the tool. Maybe you could add that there. Maybe integrate a "best in class" example from the respective industry. Maybe you can even pick out top assets from the most important industries. This is exactly what TikTok has been doing for a few days. Having this possibility always helps me a lot. I mean, some of it might be industry-specific, but in principle, you can maybe cluster it down to a few and then say, "Best in Class" examples

are shown by the tool. You could then start from there and brief a creative hub, for example, so that it is oriented to the examples.

I. [00:08:41] Okay, so you mean clearly pointing out what are the best practice examples from other companies from a sensory communication perspective.

IP7 [00:08:43] Right. These "best-in-class" examples are really quite cool. The same may happen with 3D product visualization. You also have a few examples here where you say this is well-implemented and considered a reference. That could be used as a reference. The next step - let me think about this for a moment - would be to go one step further and say, for example, in the case of sensory audio, what aspects need to be considered in sensory content creation. That includes, for example, the soundtrack should be of high quality and recorded with professional equipment. This means that as a layman, you should receive advice and not, for example, simply start recording content with an iPhone or something similar, and then it sounds totally bad and somehow doesn't work. In this context, you also say again that these are the top five aspects you must consider when creating. Or to say right away, here we might even have someone or a selection of people who can help you with that. In the end, you might even be able to create an affiliate program there that you earn from again.

I. [00:10:10] I also find your point about the checklist interesting because it's not currently included. The sound quality also makes a difference, of course, from a sensory perspective. It's always about sensations, about moods as well. And it would be very bad if the website visitor could already be annoyed by the fact that he has the feeling that the recording was made with a device of insufficient quality or that it was designed in a boring way. From a sensory point of view, there should always be a matching principle when creating content. Related to your industry of dietary supplements, the content also connects in the direction of nature with lifestyle, sports, or the like.

IP7 [00:11:03] Yes, exactly, that's exactly how we do it.

I. [00:11:03] Great, and here you should, of course, if you now go to the acoustics and want to integrate this, which you just mentioned as an example, just also underline something acoustically that matches. In videos, for example, in which you want to convey a healthy lifestyle through the advertised products, you could, for example, use something abstract like birds chirping or similar sounds that are close to nature. The viewer can better imagine what benefits the product should have, namely the embodiment of liveliness.

IP7 [00:11:43] Absolutely. That's also exactly the point of how we proceed with one of our brands, namely, totally close to nature. On the other hand, the other brand is supposed to be a bit more rational and focuses on performance in the content. In other words, on the topic of sports.

I. [00:12:02] Very interesting, so you have different brands?

IP7 [00:12:04] Exactly, we have a high-performer brand for people who simply purchase the products as a good supplement in everyday life but don't peddle that they have found a new nutritional supplement that fulfills and functions. The target group simply wants the basic benefit of the product to be fulfilled in that it helps and is neither too expensive nor too cheap. Period. And our other brand goes quite strongly in the direction of the lifestyle because the products are completely vegan. Therefore, they are also 1 € more expensive, but the target group is then happy with it. They tend to be people who recommend the products to others and perhaps also actively communicate to their friends that they live a very green, very environmentally conscious life.

I. [00:13:36] Again, I learned something (laughter) that it splits again in the brand architecture. But it makes sense, I think it's good, especially because you can also create a very specific sensory communication through the different brands. Okay, then, perhaps the question of what you liked best about the tool and perhaps something you didn't like so much. Is there anything that stands out positively or negatively for you?

IP7 [00:14:02] What I liked best was the start, the dashboard. I immediately feel how my index is currently standing and, above all, how it is represented through text, images, and so on. I found that very, very successful. The logical structure behind it, but also that it has gone over that it has become something more detailed, where you have then divided according to the senses and get more details. So, I really like the general structure, which is extremely successful because if you scroll down further, you can look at the examples and go into detail. You can see in detail how you have performed. So, I like the general structure very much. I am just thinking about it because I noticed the Word Cloud Chart on the Benchmarking tab. I don't think I could do anything with that. Either because I don't understand it or because I just don't like it. At least the very large representation of all those words there on the right may look nice, but I can never do anything with it. It actually confuses me almost more than it helps.

I. [00:15:38] That coincides with other statements, which I can understand. It was really just meant to be an add-on. You can do a little bit with it, but only limited. However, by showing - and this was also the tenor from the other interviews - for example, in this context, which sensory keywords are the best in the industry studied and showing whether you also use these sufficiently compared to the competition or could improve here. It remains an add-on, though, definitely. But while we're on the subject of benchmarking, I also have a question about this. Namely, whether the comparability to the relevant competition is according to your expectations, would you agree with that?

IP7 [00:16:46] Yes, definitely. Just like with the dashboard as well, I think that's very good, with the exception, maybe, that you could leave out the Word cloud chart at that point.

I. [00:16:46] Well, okay. Then, if you have no other comments, I would move on to the next point, the financial aspect. What potential financial impact would you see if the tool were to be used in a functional version in daily business? As a reference, I can give you an example of a value of up to 15% sales increase as an orientation, which can be achieved with active optimization of content in e-commerce. How would you estimate that now? Given

this guideline value as well? Feel free to just give your gut feeling. What do you think would come out of using that?

IP7 [00:18:10] Can you repeat very briefly what exactly this up to 15% refers to?

I. [00:18:23] Yeah, sure. That's an average value that could be achieved through general content optimization in e-commerce. That means per se, first of all, very broadly that you use texts, images, videos, etc.

IP7 [00:18:33] Okay, so I think the OSMI index's issue is not primarily traffic, as in SEO optimization, for example. But rather, it's tangential to the user experience and, therefore, the conversion rate. And there, I think, is extremely much possible because a conversion rate in good stores is constantly worked on with A/B tests, etc. This means that the impact here can be as high as you want, e.g., up to 200%. If you simply assume a standard store with a conversion rate of 1 and 3%, I can imagine a realistic estimate of a sales increase of 20 to 30%. Provided, of course, that the content quality is really worked on and the tool with the OSMI is taken into account. But if you are already at a higher level, i.e., already have better content, then the effect would be lower.

I. [00:20:13] Exactly, you have to say that the effect of a sales increase depends very much on the starting point from which the company starts.

IP7 [00:20:21] That's what I mean, exactly. If the content is bad, the company will be able to double the conversion rate and, therefore, the revenue. But if you've already done content optimization, I think there should still be 20% to 30% in there.

I. [00:20:34] Okay, so do you think optimizing the online sensory content in this way can also affect other financial aspects? I'm going to give two examples, so generally marketing efficiency. So, related to the people who ultimately have to design, implement, text, etc., the content. Or also other topics like returns. Could these be topics where you say it could have an influence?

IP7 [00:21:10] Yeah, good point. I haven't thought about returns at all because we actually don't have any problems with that. But quite a lot of companies from other industries do. Because you often don't know or you can't rely on what you're going to get when you're just looking at a picture of a product, for example. Returns can also hurt companies significantly financially, so yes, definitely. With returns, I definitely see that as very relevant. I also have another point in mind right now. So, I think it's also relevant to customer retention rate. If it's about improving the user experience and customers feel really cached that they will buy again from the same store even the next time when the product is used up. Assuming it's such a consumable product, the customer is happy to go back to the website for it again. So let's assume that the customer liked the virtual shopping experience so much that it really lengthens the page duration or the session duration in general because the willingness to simply browse increases, which is something you can somehow observe very often in the offline sector, but all the more rarely online. You're back on the X so quickly and have left the page.

I. [00:22:34] I see, so you're saying the bounce rate could go down and the dwell time could go up, correct?

IP7 [00:22:38] Exactly. Because you have much more to discover and experience, that's what you know offline when you like to spend a little longer with the store and the product because you have more opportunities to experience it with your senses. That could really be another financial factor here.

I. [00:22:55] I had just touched on it briefly. How would you describe the effect on marketing efficiency by using the tool?

IP7 [00:23:00] Can you elaborate on that?

I. [00:23:02] Sure. Assuming you work with the tool, do you think that one would be more efficient in the daily work, so in the daily work of a web store manager, for example?

IP7 [00:23:29] Yes, in general. What would still help me, it just occurred to me, would perhaps be a weighting, a plan sorted according to the importance and urgency of the individual steps, which I can then work through. Which of these would the tool actually recommend that I start with? Because I have so much on the table and so many open emails. The ranking according to the greatest impact would certainly be helpful in order to start efficiently. That would help me, I think.

I. [00:24:08] Okay, so that means if you had that priority list, then you would affirm the efficiency gain.

IP7 [00:24:11] Yeah, that's right.

I. [00:24:12] Okay, then I got that. All right. In the Recommendations, sorted by media type, there are even priorities already stored in the tool. But it's probably not that obvious. And what's not yet available is another list you can work through according to absolute priority and across the media type. I think it's a good idea, and I've made a note of it, to summarize it again for reasons of efficiency so that you can then start directly with it.

IP7 [00:24:59] Exactly, to tackle the individual optimizations step by step.

I. [00:25:01] All right. Okay. Then those were all my questions about the tool itself. Besides that, do you have anything else to add? Anything else you want to get off your chest that we haven't talked about yet? Anything else you can think of off the top of your head?

IP7 [00:25:18] No, I think I said everything I wrote down.

I. [00:25:18] Okay, then I just have one more request. It's finally about your expert assessment on different topics that are just related to the topic area of the interviews. I'm going to open the file for a moment, just a moment. You see that the first five statements are on a Likert scale from one to five. The one would stand for you fully agree, and the five for exactly the opposite. The last two statements are in school grades, where the one would be the best, and the six would be for the very poor. All right, then, I'd like to start with the first statement. Are you a marketing expert?

IP7 [00:27:09] Yes, I would go to a one here; I strongly agree.

I. [00:27:32] Are you an expert in sensory marketing?

IP7 [00:27:40] Actively, I've rarely ever done this and not that many touch points so far, even though I do know the topic in principle. I had thought three at first, but I would still rather take a four; I disagree when it comes to being an expert on this.

I. [00:27:50] That's also perfectly fine. In fact, I deliberately did it this way to address and survey a broad user base as possible. You've already said what's important about the tool in your answers today. Namely, to efficiently show non-experts what possibilities there are for optimization. Ok. Are you an expert in web design/digital media?

IP7 [00:28:02] Yes, a two, agree.

I. [00:28:06] Are you an expert in e-commerce?

IP7 [00:28:09] Here, I would make it a one, I strongly agree.

I. [00:28:09] Are you an expert in marketing analytics/SEO/campaign management? This also includes performance marketing via meta or similar.

IP7 [00:28:34] In my sub-discipline of performance marketing then one, I strongly agree.

I. [00:28:41] Okay. Then, we'll go to the last two statement ass I said, this time in school grades. The one would be the best in this case or, the six the worst. If you had to assess the solution presented to you again in summary, it would be to assess sensory marketing in terms of e-commerce. How would you spontaneously evaluate it in school grades?

IP7 [00:29:33] So, as I said, with those one or two things that you might add like this task list to work off of, I would actually go to one as well, very good.

I. [00:29:47] And then again to the last question. Because you have now conducted two interviews with me. If you had to assess your knowledge in the specific area again, how would you assess it?

IP7 [00:30:02] La ss me for a moment. I would schedule a three, satisfactory.

I. [00:30:25] Okay. At this point, I would say thank you very, very much for your time and your answers.

IP7 [00:32:57] Of Course, You´re welcome.

- End of Interview -

Appendix 26. Interview IP8 for second SSI

I. [00:00:35] Hello, very good. Thank you very much for your willingness for a second interview. Briefly on the content: Well, I've already touched on it. The interview structure should, first of all, be about usability, that is, the design. How well does it work? Then, about the information content. So, what can you actually glean from it? Then, about the comparability. That was also a topic, a criterion that emerged in the first interviews, and another financial perspective. But that's only about an assessment and, in the end, briefly about your person. And with that, I would like to start again very shortly. Has anything changed about your current job since the last interview?

IP8 [00:01:27] It's all the same.

I. [00:01:29] With the exception that you're now on the verge of completing your master's degree on the side and writing your thesis in the marketing department, correct?

IP8 [00:01:37] Exactly. Well, I don't know what I told you last time. Still, I'm working in the brand relations department at one of the biggest fashion retailers in Germany. On the side, I'm finishing my master's degree, correct.

I. [00:01:53] Briefly, again, on live shopping, you probably promote that on your website and social media, right?

IP8 [00:02:03] Right, on social media as well. We've also been working with an external service provider who does display ads for us and newsletters, where appropriate, when there are slots. Actually, you can get a reach on all kinds of channels.

I. [00:02:23] And then, are you specifically responsible for the live shopping itself, or do you also do the content for the website?

IP8 [00:02:31] We have the content produced in advance by influencers, and then we use that for communication and for live shopping. I'm also involved during production, and I take care of the planning beforehand so that everything is in place for that. Then, on-site at the production, the whole thing runs. And, exactly, in the aftermath, we then also have a subsequent push that we also advertise the whole thing because the stream is also available in the aftermath in our store. It's not just the live stream itself. Exactly, I actually do this all-round package from advance planning to communication planning to production and reporting, including post-advertising.

I. [00:03:18] Ah, okay, good. I just wanted to ask that again in terms of if anything has changed with you professionally. But that clears up the question. Then, I would start with the first interview question. You have looked at this tool. So, as I just said, I use the terms app, mock-up, and prototype all synonymously, and these just stand for this tool that I developed there, which is currently designed as a click dummy in the Figma design tool. Maybe you already knew Figma before. So you can build such mock-ups with it very well. And in fact, you can click around in it to search a little bit. And that's also what the first question is about, because in terms of usability,

Would you say that this has a practical benefit, purely from a usability point of view? So, would it be useful for you in practice? How would you describe and justify this in terms of usability?

IP8 [00:04:26] Basically, yes, I think the usability is good. So, I think it's great that you have such an overview at the beginning with the dashboard, and then you first have the big overview, and then you can click into the details. I was wondering if the whole tool will be an app, which would probably be a bit different in terms of design in the app, right?

I. [00:04:52] Good point. It's not supposed to be an app in the sense that it's a mobile version, but it's most likely primarily a desktop version because it's more aimed at B2B users and less at people who work with mobile devices. Basically, the whole tool is supposed to be responsive so that it might still look good on the iPad, but it's basically a desktop version.

IP8 [00:05:22] Oh, okay. So I think it's very understandable because you use a graphic and icons and then go from the rough to the details. So, I understood it well. Your question was also related to usability and visualization. So, as I said, the icons and, then again, the textual explanation, partly with the graphs, make it understandable. The only thing that is a bit unclear to me, but maybe that will come later, are the bars when you go into the detailed view and then look at the sensory indicators. You have to look very closely and with the rating scale Weak, Standard, Good, Excellent. I asked myself what these bars mean. There are numbers (0,1,2,3) and partly the bars. That is not quite understandable. Basically, I understand that the different elements are to be evaluated.

I. [00:06:46] Yes, it's good that you bring that up because that's also been asked before. The bar should represent that no further evaluation is possible for this specific indicator and that the evaluation range is, for example, only between zero and one. But this can be solved better from a usability point of view. For example, if you hover over it with the mouse, you'll see that the "Maximum Level" has already been reached. Something like that, an explanation. Then, it might have been easier to understand the aspect.

IP8 [00:07:24] I see. Now I see it, too. Namely, it says 0 to 3, 0 to 1, 0 to 2. Well, if you know it, then it also makes sense (laughter).

I. [00:07:33] Yeah, exactly. It was clear to me if you think about that representation alone. But it's good that we're talking about it. Because then it can be improved. Very good. Okay, then the next question would be in terms of the information content that you can take from the mock-up. Is the specific information about the sensory communication quality of a website that you get there - now abstracting from the Nespresso example and more general - according to your expectations that you would have of such a tool if you were to use it?

IP8 [00:08:17] Absolutely. I think it's good that you have the overview directly with all the senses. In principle, there is an evaluation for each of them, with the indication of what percentage of the respective sense is addressed via the website. What I had wondered a bit before was how a website can appeal to the sense of taste, for example, or the sense of smell. But that also becomes quite clear when you click into the details. There, it is explained that

one also tends to start from images, texts, videos, or visual features, which can then embody the sense of taste, as in the case of Nespresso. The example fits quite well with coffee because you can't directly taste or try it digitally. For me, that's very understandable and shows what approaches there are to get around this. In the second step, the question would be how this would be presented to other websites. It is then probably difficult with the sense of taste or smell. But I think it's good that all senses were included in the content because I think that also belongs in the tool. Especially because we are talking about a multisensory approach. Also, in the dashboard area, there is an overview with icons for text data, image data, video, and audio data, and for me, these are exactly the standard elements that you have or should have on a website. There is nothing missing for me now, and that covers it very well.

I. [00:10:06] So, are there things you may find redundant in return?

IP8 [00:10:14] Yes, it's just quite a lot at first glance.

I. [00:10:22] That's right, okay.

IP8 [00:10:26] Yes. So, I was now only on the dashboard. If I click now times to the benchmarking and look there, I find that it is also very good that the comparability is implemented in the tool. But specifically, I don't find anything superfluous.

I. [00:10:38] Okay, then we can go directly to the next question because this one aims exactly at the comparability to other competitors in the same industry. And there again, the same question goes in the same direction: If you want to compare yourself with competitors and then you see this benchmarking, is that also according to your expectations? Are there any suggestions for improvement, or are you basically satisfied with it?

IP8 [00:11:11] I think the overview with the competitors is very good. Here, you can see at first glance where you stand in the comparison. Only with the word cloud chart did I wonder exactly what I could do with this information now. Is that basically based on comparable websites and the most used terms there? So, I ask myself the extent to which I need that.

I. [00:11:41] So it's more like nice to have?

IP8 [00:11:43] Exactly, it's nice to have. But I definitely find the comparability with the competitors more exciting.

I. [00:11:53] Okay, so are there specific things that you like to compare to the competition regarding sensory communication quality? Or is everything covered so you could get a good overview of the comparative benchmarking of the industry at first glance and work with that?

IP8 [00:12:16] I think it's very good for the overview. The only question here is the comma numbers for the senses. Are these now also the percentages that I also saw on the dashboard?

I. [00:12:35] Yes, exactly. That's actually an improvement opportunity that I've already written down. I mixed things up a little bit there. But I didn't want to change that now in the ongoing process of the interviews. Sometimes, I used percentages, and sometimes I used decimals. Ultimately, it doesn't matter because the OSMI score you can achieve is a concept, a hypothetical index. The maximum level would be one or 100%, and the lowest would be just zero or 0%, subject to industry-specific weighting and possible sensory overload. Therefore, it doesn't really matter whether you write decimal numbers or percentages. But of course, I would have to adjust that so that it is consistent in the tool on all subpages. Exactly, and the OSMI evaluation concept behind it can be found by clicking on the Concept tab in the navigation bar. That's where it's explained again. But probably, it makes sense to include a bit of background information to understand the whole thing on other subpages as well.

IP8 [00:13:47] Exactly; by that, I mean to learn a little bit more about the background, how the sensory analysis works, and on which data basis that happens. Of course, it is also making the ranking more transparent and also communicating it in other places in the tool.

I. [00:14:02] Okay, good.

IP8 [00:14:04] Now, if I understand that correctly, it's a percentage of those elements on the website per sense, right?

I. [00:14:19] Yes, in principle, yes. But you can think of it like similar tools that already exist, but for other disciplines. For example, similarweb for SEO optimization. That's a tool that already exists today, but you never know exactly how the ranking is mapped there. That is also a bit of a secret, I think, but it would now be relatively transparent if the OSMI concept could read about the tab concept to understand, if interested in deep dive, how the whole thing comes about. There is also a weighting depending on the industry where you are. In the mock-up, this is specifically for the food sector, and it would be a completely different weighting for other sectors, such as the automotive sector. That would be the basis on which the actual analysis starts. Subsequently, it would be analyzed which sensory elements/indicators are integrated on the website at all. For this, there is an evaluation and also, depending on the underlying scale, a more in-depth evaluation, for example, whether one has done a bit more sensory in textual content or in pictorial elements or not yet and could then improve. This results in the weighted OSMI score, where you can at least see where you stand and whether you could improve in some indicators. You can also analyze whether there are other competitors who have achieved a better score, and then you can work on your own content, so to speak, and pull the sensory score up again. And that is the basis of the whole thing.

IP8 [00:15:52] And then there's sort of software behind that that then analyzes that?

I. [00:15:55] Exactly. The mock-up in Figma should illustrate the result of my investigations because I had to determine in the first place whether a sensory evaluation of e-commerce websites could be realized automatically due to the many different content types. The whole thing should work in a live version automated on the basis of

AI, which then analyzes the texts and images, and then you can also form a kind of infrastructure, which, in the end, calculates this score, which you would otherwise have done manually.

IP8 [00:16:54] Ah, all right, I think that's great.

I. [00:16:54] So precisely what exists today for other disciplines. But specifically, on the topic of sensory communication in online domains. Okay, so are there any other aspects that we haven't addressed yet but that you think would be very important for a sensory evaluation for a framework like this? What you might also be missing now, or what you do not like?

IP8 [00:17:35] Now, just off the top of my head, I can't think of anything. I think the dashboard already contains a lot, a lot of information.

I. [00:17:50] Okay, very good. What do you think is the best thing about the tool when you review it now?

IP8 [00:18:05] I think it's good that you know at first glance how it works. In the beginning, you come to the landing page, you can enter the website, and then you see the results per sense at first glance in relation to your own website. Then you can see directly, for example, if I have 0%, for example, in acoustics, I can see directly that I may still have room for improvement there, depending on the industry. And if I can then compare this with my competitors, all the better. Especially if the tool tells me that my competitor has achieved 30% in acoustics, for example, then I can look at what I must improve to get closer to the competition. And then on top of that, there is also the option of directly receiving suggestions on what could be optimized sensory-wise. I think that's also very helpful. And I think you get a good first impression. I said at the beginning that you can go into detail here and look at which elements actually contribute to the sensory communication quality. Yes, I think that's very good.

I. [00:19:25] Are there also things you don't like or would change? For example, you already mentioned the explanation with the bars. Would there be more from your point of view?

IP8 [00:19:42] I think it would be really cool if you listed the examined indicators, i.e., the elements, in the tool generally so that you can also look at them again and then really see specifically on your own website which element is meant here and either has already been sensory rated well or can still be improved.

I. [00:19:58] Good point. It will be the same in the final version, then. Now, of course, it was that it all had to be built manually or manually, and the tool is not live yet. I also tried to make it as generic as possible. That's why most of the images are from my company example, but also partly from the Internet, to show what optimization potential there is in terms of sensor technology. That doesn't mean that the website under investigation is performing poorly per se, but that there is still some room for optimization in terms of sensory content.

IP8 [00:20:43] Right, okay. That's what the tool gives back.

I. [00:20:43] Okay. Very good. Apart from the purely content aspect, I would like to ask you two more questions on the financial aspect. Namely, based on your collected impression of the mock-up and the intention to evaluate sensory content online, how would you now evaluate the financial aspect of using this software in your daily

business? Do you think the tool would be helpful? So purely in %. For example, we can set a number or a factor in terms of sales. So, in general, would you say that if you dedicate yourself to sensory optimization on the web and work with the tool, it could have a financial, positive impact?

IP8 [00:21:35] Yes, definitely. When I think about our online store, which is constantly being optimized, I can imagine that very well. So, we have a completely separate team that only takes care of the content in the online store, and they're also constantly working on it and investigating the question: How can we somehow make the content more visual and more lively? It would definitely be helpful if you then had such a tool for sensor technology that really tells you what you already have and certain content is perhaps still missing or could be optimized. Then you save yourself, on the one hand, in a certain way, the analyses that you're doing now, and if you can technically optimize your store content to that end, I think that's already very, very relevant. Especially because the optimization then, in turn, also encourages the customers in the best case to buy, of course, or even to buy more or more often. That then has the financial aspect again. So, I see it that way, yes.

I. [00:22:35] Then, one more question in terms of your purely free estimate, just in percent. As a reference value, I can give you an average value of up to 15% that you could achieve in terms of sales when using tools of this type or optimizing the content shown there. If you now spontaneously give an estimate of what the use of such a tool could bring with it financially, what would you spontaneously estimate?

IP8 [00:23:26] Spontaneously, I would have said 10%. I see that as quite high. However, the tool only gives you suggestions. You still have to implement it. So that's on top of it. The tool alone will not increase your sales. But the tool helps you to optimize.

I. [00:23:46] Okay. I have one last question on this aspect. Namely, from your point of view, are there also other financial aspects that are tangent with such a tool? I'll give you an example now with the return rate.

IP8 [00:24:13] Yes, if you can present a product more vividly than the classic product photo, then I could imagine that quite well. For example, instead of or in addition to the product photos, we now have a complete wear video of the product, in which a model wears the clothes or 360-degree rotations to get additional information on how the cut turns out or similar. So basically, by making the product presentation more vivid. I can well imagine that this will make it easier to find the right product and consequently reduce the rate of returns because the online presentation is getting a bit closer to stationary shopping, i.e., the channel where I can really try on the product.

I. [00:25:04] I see, all right. You had just said something in the following direction as well, but you hadn't mentioned it specifically yet. I mean a possible increase in efficiency, that is, in terms of the work of you and your colleagues. Could that also be a possible financial benefit from your point of view?

IP8 [00:25:28] That's exactly what I meant. People are already working on conducting their own analyses on their own websites and conducting competitive analyses. To see how the users receive the content or what is perhaps still missing and, of course, what other competitors are doing. I think, especially if we have the sensory benchmark,

the comparison, you save, on the one hand, the independent checking of the competitors, but also the content analyses that you then carry out on your own site. In any case, yes.

I. [00:26:08] Very good. Then we're actually already at the end of the interview. From your point of view, is there anything else that we have forgotten or that you would like to add? To whatever? Can you think of anything off the top of your head?

IP8 [00:26:21] I just saw the "Buy Professional" button at the bottom. Is there going to be some kind of subscription model there in the future, or how would that be planned?

I. [00:26:31] Oh, I just added that sentence to make the mock-up look a little more authentic, but it has no deeper meaning.

IP8 [00:26:34] But it probably wouldn't be free in the future if that's going to exist then, would it?

I. [00:27:41] Unfortunately, I can't answer that at the moment. So, what is the goal of all my work? As I indicated in the first interview just under a year ago, the goal of my work is to determine whether there is a role for sensory marketing in the online context, whether there is a need to evaluate and optimize that, and whether artificial intelligence methods would be able to enable that in an automated way. The second interview, which we are currently conducting, is intended to finally establish once again whether the developed solution visualized by means of a mock-up is what the business community envisions and really needs. Through your answers and opinions and those of seven other interview partners, I would then like to determine whether - with a few adjustments perhaps - the tool is attractive for operational implementation. This would give you an additional tool to ultimately optimize sensory communication with a focus on the online domain. You also have to say clearly, and this is also reflected in the percentage figure you mentioned, which I think is very good. You have set it lower than SEO, for example. And I would absolutely subscribe to that because SEO is probably even more profitable in terms of sales impact than if you optimize and improve your online content in the last sentence to exaggerate. That's clear. But there are some studies that really say that if you optimize sensory communication and expand your content with this perspective, this also brings a financial advantage. That's not so easy to quantify, though, because you would need various additional studies to do that. Sure, I think if you eventually go live with the tool and really need resources to do that, you can hardly do it for free. At least there is a basic and pro version. Finally, I would briefly share my screen again, and I would have brought two statements analogous to last time. Again, I would just ask you to simply give your own assessment of it. The two statements are in school grades.

I. [00:31:22] Okay, so the first question would be, are you a marketing expert?

IP8 [00:31:29] Yeah, I would say two, agree.

I. [00:31:34] Are you an expert in the field of sensory marketing?

IP8 [00:31:39] Personally, I find this mega exciting because, in addition to my job, I've also really dealt with this a lot in my master's thesis because it's also explicitly about the fact that live shopping offers a much more vivid sensory experience than the classic product side. So yes, two agree, I would also say here.

I. [00:32:05] Okay. Are you an expert in web design/digital media?

IP8 [00:32:12] So, web design? Yes and no. So, by the fact that I had started at that time in the company and we worked quite a lot with HTML and so on. Yes, and then make a three. So, I'm not an expert now, but I'm neutral.

I. [00:32:28] All right. Are you an expert in e-commerce?

IP8 [00:32:31] Yeah, I would say two; I agree, as well.

I. [00:32:35] And the following statement is a little bit broader now. I called it "marketing analytics." But by that, I really mean everything that has to do with it. SEO/SEA, but also campaign management in general. Do you see yourself as an expert here?

IP8 [00:32:49] Yeah, so SEA and SEO are not so intensive, I must say. But when it comes to Google Analytics and all other website analytics, then yes. I don't know who that is, also one, two, or three. It just depends on which area. In my area, we also have a lot of analytics, so of course, I know my way around.

I. [00:33:13] So I wouldn't give you a number, but based on what you just gave me now, then I would actually put a two if you agree.

IP8 [00:33:23] Yes. If you define that broadly, as I mentioned, then absolutely.

I. [00:33:26] Right, it's broadly defined. Okay, then, the last two statements. This time, as I said, it should be rated in school grades. How would you rate then generally now based, of course, on the actual state of the mock-up in terms of the problem/need that was originally expressed, which is sensory evaluation of e-commerce websites or e-commerce content in terms of sensory marketing?

IP8 [00:34:18] So I would say very good. Yes, one, very good.

I. [00:34:25] And now that you have heard a lot about my specific topic of the dissertation through two interviews, how would you evaluate your level of knowledge in this combination of e-commerce and sensor technology?

IP8 [00:34:48] Two, good, I would say here. Also, again, the point is that I'm also in a very similar area with my master's thesis and professionally as well.

I. [00:35:00] Okay, thank you very much, very good. At that point, we can actually end the interview. Again, thank you very, very much for the second interview

- End of Interview -