

The Power of Senses

Citation for published version (APA):

Stead, S. (2020). *The Power of Senses: Unraveling Multisensory Customer Service Experiences*. [Doctoral Thesis, Maastricht University]. Off Page Amsterdam. <https://doi.org/10.26481/dis.20200612ss>

Document status and date:

Published: 01/01/2020

DOI:

[10.26481/dis.20200612ss](https://doi.org/10.26481/dis.20200612ss)

Document Version:

Publisher's PDF, also known as Version of record

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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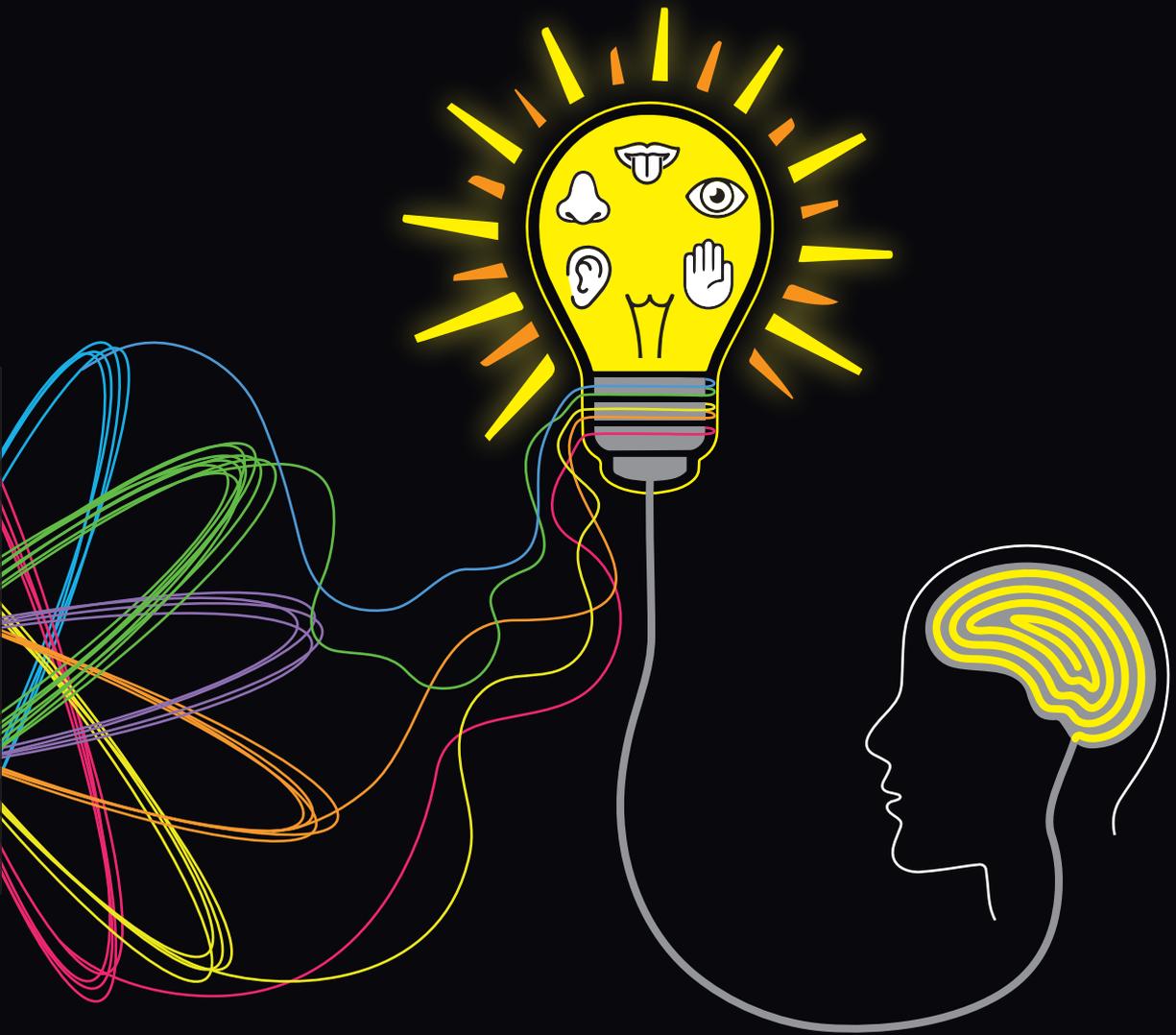
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The Power of Senses:

Unraveling Multisensory
Customer Service Experiences



Susan Stead

Propositions belonging to this Dissertation

The Power of Senses: Unraveling Multisensory Customer Service Experiences

by Susan Stead

1. Only when the sensory dimension of customer service experience (CSE) is understood, we can infer the influence of the other four dimensions: physical, social, cognitive and affective and derive at a holistic understanding. *[Manuscript 1; Manuscript 3]*
2. Tackling complex research phenomena such as CSE requires multidisciplinary, integrative research perspectives that move beyond disciplinary silos. *[Manuscript 2]*
3. Schematic information processing constitutes the scripts that write CSE. *[Manuscript 3]*
4. Triggering the activation of positive, situational-relevant, and matching schemas across the service encounters, is what makes or breaks CSE. *[This dissertation]*
5. To develop successful innovative services, necessitates a multisensory understanding of CSE. *[This dissertation]*
6. Designing multisensory rich and meaningful CSE creates a win-win situation for customers and organizations.
7. All our knowledge begins with the senses *[Immanuel Kant]*
8. Nothing ever becomes real till it is experienced *[John Keats]*
9. Success isn't given, it's earned; on the track, on the field, in the gym [and at work]. With blood, sweat and the occasional tear. *[Nike]*
10. If you can dream it, you can do it *[Walt Disney]*

**The Power of Senses:
Unraveling Multisensory Customer Service
Experiences**

Susan Stead

Maastricht University, School of Business and Economics

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ISBN: 978-94-93197-09-1

Cover design: Jennifer Stead, Aachen, Germany

Printing by Off Page, Amsterdam, The Netherlands

The Power of Senses: Unraveling Multisensory Customer Service Experiences

Dissertation

to obtain the degree of Doctor at Maastricht University, on the authority
of the Rector Magnificus Prof. Dr. Rianne M. Letschert in accordance
with the decision of the Board of Deans, to be defended in public on
Friday, 12th June 2020, at 14:00 hours.

by

Susan Stead

Supervisors:

Prof. Dr. Gaby Odekerken-Schröder

Prof. Dr. Dominik Mahr

Assessment Committee:

Prof. Dr. Jos Lemmink, Chair

Prof. Dr. Sandra Zwakhalen

Prof. Dr. Allard van Riel (Hasselt University, Belgium)

Prof. Dr. Bart Nieuwenhuis (University of Twente, The Netherlands)

A reflection on my PhD journey

When I had just started as a PhD student a few years back, I wondered what this journey would be like and how I would feel when finally reaching the finish line. With every PhD year that passed, I pondered how I could possibly describe this rollercoaster journey with all the extreme emotional and mental states that I have experienced along the way. Today, so close to the finish line, I think I have found the right anecdote that explains my PhD journey.

Doing a PhD is like preparing for your very first marathon: the preparation requires full commitment and dedication to go for it. If you want to make it, you have to fight hard for it and sacrifice many things along the way. You have to push physical and mental boundaries beyond what you thought was possible and far too often, your friends and family have a hard time understanding why you would possibly endure all this out by choice. While you need the support from many people around you, it is yet a journey that you pursue on your own.

In the beginning you create your master plan, only to notice that far too often you need to modify and adjust it. You have to deal with unforeseen injuries, of which you quickly have to recover and fight even harder to be back in the game. With every injury you learn how to protect yourself better and you come back stronger. But still, there are moments when you doubt you will make it; when your energy is low, every step takes longer than usual, and you long for nothing more than a small break. Overcoming these difficult moments is what ultimately makes you stronger. You should not compare to others, because although the race might be the same, the preparation, sponsorship and training might be very different. Yet it is sometimes difficult to blend it out, when you go the extra mile and keep on working, while you see others already celebrating one success over another. But you stay patient, you train even harder, and you tell yourself that your time will come. You meet people who believe in you regardless of the mental or physical state you are in, and you meet people who think you cannot do it and suggest to give up on it. And you go ahead and prove them wrong. Because at the end of the PhD race, you realize that you already ran more than one marathon along the way and what you in fact are prepared for is an ultra-race.

And today reaching the finish line, I can say that it was not an easy journey that lies behind me, but it certainly made me grow in so many ways. I have

learned a lot: about myself, about others, about luck and bad luck, about success and about failure, but most importantly about accepting that there are many things beyond my control. And if I were to pinpoint a key lesson that I've learned, I'd say that it is not about hoping for a storm to pass, but learning to dance in the rain. Anyone can give up, in fact it's the easiest thing in the world to do. But to hold it together when everyone else would understand if you fell apart, when it seems that everything is turning against you, and to keep fighting to reach your goals, that's true strength. And the harder you work for something the greater you will feel when you achieve it, and allow me to say: today, I feel absolutely fantastic and incredibly proud of the journey I mastered.

Acknowledgements

Along my PhD journey there were many people who supported me to get to the finish line. I would like to use the following paragraphs to express my gratitude.

First and foremost, I would like to thank my two supervisors Prof. Dr. Gaby Odekerken-Schröder and Prof. Dr. Dominik Mahr for their support and guidance along my PhD. You both taught me so much about academia, research, teaching and project management in general.

Furthermore, I would like to express my deep gratitude to my committee members Prof. Dr. Jos Lemmink, Prof. Dr. Allard van Riel, Prof. Dr. Zwakhalen, and Prof. Dr. Nieuwenhuis for their time and effort put into reading and evaluating my dissertation.

In addition, I would like to thank my current and former colleagues from the Marketing and Supply Chain Management department. You all contributed in one way or the other to my PhD journey and created this ever-lasting experience for and with me. I would also like to thank all my current and former colleagues from SSF. The time at the little SSF island has been so human, heartwarming, and rewarding for me.

I have also been fortunate to (informally) form part of a community that spanned across the boundaries of Maastricht University. Dear SDIN network, meeting all of you across the globe for conferences and courses was so enriching to me. I would like to extend my gratitude to the many early-stage and more experienced scholars that I met at international conferences, some of whom became great friends, too.

A very special thanks goes to my official and unofficial paranymph-quartet: Ruud, Martina, Alex, and Timna. All four of you played such an important role in mental support, injury recovery, and monitoring of any sort of hydration and nutrition. When spending time with you I could not only just be who I am, but we could also enjoy celebrating the bright sides of academic life. How Bob Marley would put it: Don't worry, about a thing, cause every little thing is gonna be alright. Because of you, I still believe in Bob Marley. ☺

Finally, and most importantly, I am grateful for a whole other world out there beyond academia that kept me grounded and provided unconditional support, even in the most difficult times. I wholeheartedly thank my family and friends for keeping up with me and for patiently accepting to account for approximately 10% of my time, while 70% went into my PhD, and 20% of the time into my sports. You often only saw me late at night after I could unwind my mind and thoughts in running, football practice, or at the gym. I know that especially the days where I was pressured and imbalanced because time didn't allow me to switch off my mind with sports were tough on you. But still, you were the ones bringing me back into the race, cheering me up during difficult times, and telling me how proud you were of my stubborn devotion to finish what I have started to the best of my abilities. I'm so wholeheartedly thankful and proud to have you in my life. Knowing that you are all waiting for me at the finish line to celebrate this great achievement, means the world to me.

Susan Stead,

Aachen, Germany, April 2020

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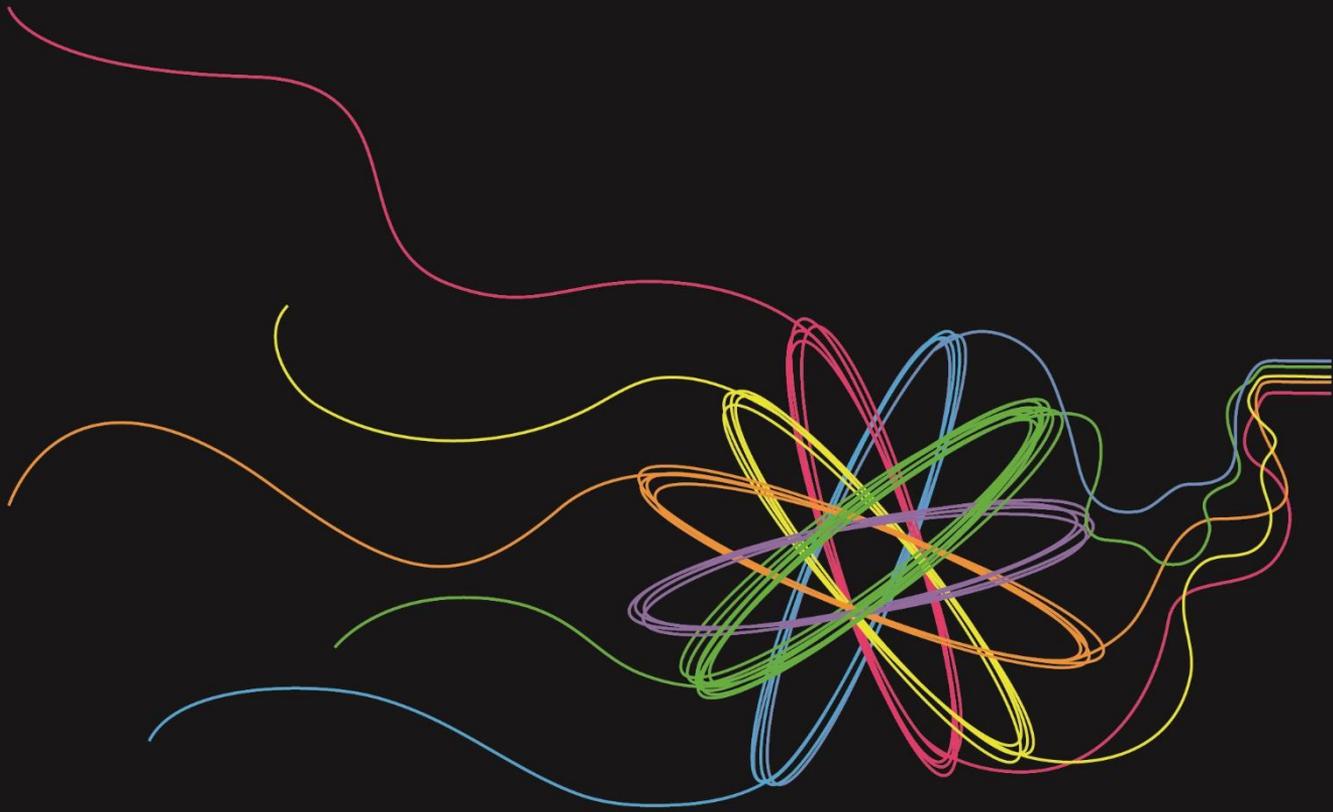
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Introduction





Welcome to the customer experience battlefield

We live in an experience-driven world, in which customers expect increasingly innovative and extraordinary service experiences (Zaki 2019). 87% of marketing analysts indicate that customer experiences are extremely important for three reasons: (1) to improve customer retention, (2) to increase value and reliability to users, and (3) to increase data-driven personalization (Forbes 2019). Because all three reasons contribute to revenue growth (Gartner 2020), providing a poor customer service experience (CSE) can backfire. In a recent global customer service survey by Microsoft (2017), 56% of respondents said they had stopped doing business with brands as the result of poor CSEs.

Think, for example, about your last onboard flight experience with an airline. Did you fly for work or vacation? Try to revisit your experience from that flight. Regardless of whether it was positive or negative overall, what memories do you recall? Any memories on how comfortable your seat was? Do you remember the food or drinks you were served? Were there any particular smells that you recall? Perhaps you are thinking of something about the entertainment that you chose—movies, music—your chats with other passengers, or whether you got some work done. If this was not your first flight, you probably have vivid memories of previous flights that are reference points for your last experience. What all of these memories have in common is that they relate to the five dimensions of CSE. In this dissertation, I define CSE as:

A multidimensional construct that entails physical, social, cognitive, affective, and sensorial elements, which are triggered through direct or indirect interactions along the customer journey (De Keyser et al. 2015; Lemon and Verhoef 2016).

Increasingly, service providers are seeking innovative ways to design services that facilitate rich, unique experiences at all five levels (i.e., physical, social, cognitive, affective, and sensorial). The core service of an airline, transporting passengers from location A to B, is a commodity. In today's onboard journeys, not only the smell of perfume fills the aisles of the plane, while you can buy a variety of duty free products from a complete marketplace assortment, most airlines also serve high quality culinary menus from which passengers can choose, and offer entertainment packages providing highest sound and pixel resolutions, with a movie repertoire that comes close to Netflix's media library.

The sensory dimension of CSE

Every element that you remember about your flight experience relates to your senses. Everything we see, smell, hear, touch, and taste influences our perceptions and shapes our experiences (Krishna 2012). This profound impact on our senses is not new to marketers and service providers, who have identified sensory marketing and the design of multisensory rich stimuli in service environments as the next battlefield, in which practitioners will strive to set themselves apart from their competitors (Scott and Uncles 2018). The airline industry is just one service environment in which service providers are seeking innovative ways to move beyond core services by creating extraordinary multisensory experiences. In this dissertation, I define multisensory stimulation as:

The design of sensory stimuli with the purpose of engaging all senses to influence customer perceptions, evaluations, and behavior (Krishna 2012).

The challenge to service providers resides in the highly personal and contextual nature of CSEs (Palmer 2010). That is, the exact same service offerings, with the exact same provider-induced sensory stimulations, can result in very distinct customer experiences, because no matter whether service providers deliberately induce sensory stimuli—or stimuli occur beyond the control of providers—our senses consciously and subconsciously select only a certain number of relevant stimuli (Dedeoglu et al. 2018).

The selection of stimuli depends on many factors, such as our goals (Bagozzi et al. 1999), where we direct our attention (Corbetta et al. 2008), the amplitude of the stimuli in comparison with other stimuli (Spence 2011), and the degree to which we perceive the stimuli as congruent or incongruent with our expectations (Noseworthy et al. 2014). For example, you leave your seat on the airplane to use the toilet (a goal); you search for signs that indicate the direction you need to walk (attention); while you are walking toward the sign you hear a loud warning sound (stimulus amplitude) that you cannot link to a concrete memory (incongruence); you start looking for other stimuli that help you understand it; you notice the “fasten-seatbelt” sign has been switched on. As a result, you associate the loud sound with the visual stimuli of the “fasten-seatbelt” sign and decide to return to your seat, which means that you, at least temporarily, have changed your goal (of using the toilet). This example shows the process in which stimuli and our senses serve as grounds for perception,

understanding, and behavior (Wang et al. 2012). It illustrates that minor customer experiences can have profound impacts on core service experiences.

Research gaps: A black box in service research

The previous example highlights the complexity that accompanies full comprehension of the sensory dimension. Both the amount of stimuli that customers encounter and the diverse influences on their selection and interpretation of the sensory information can impede holistic understanding of this dimension. Although sensory marketing is steadily gaining prominence, researchers mostly have explored the role of induced sensory stimuli—such as visual, auditory, olfactory, taste, or tactile stimuli—on customer behavior. A prevalent focus prioritizes retail atmospherics (Spence et al. 2014) and product packaging (Krishna 2012), and most studies consider just one or two senses in isolation.

The discipline of service research is still young and emerging; though scholars have made great efforts to disentangle the definitional dimensions of CSE, they have not yet developed a comprehensive understanding of the influence of *all five* CSE dimensions. The role of the senses seems particularly neglected (Scott and Uncles 2018), suggesting the strong need to advance research in multiple directions. In this context, my dissertation addresses four major research gaps, pertaining to (1) the role of the five definitional dimensions of CSE, (2) sensory dimensions within and beyond the service discipline, (3) the role of the senses in shaping CSE, and (4) sensory integration and information processing.

To address these gaps, I present three manuscripts that provide a more comprehensive picture of multisensory CSE. Figure I.1 graphically depicts the research foci and objective, illustrating how each chapter addresses these research gaps. The objective of Manuscript 1 is to establish the status quo of CSE research, with particular focus on its five definitional dimensions. The objective of Manuscript 2 is to explore the multifaceted nature of sensory research through a cross-disciplinary lens that goes beyond the boundaries of service and marketing research, focusing particularly on the theoretical foundations of sensory research. Finally, the objective of Manuscript 3 is to provide a more comprehensive understanding of the sensory integration process and how senses shape CSE.

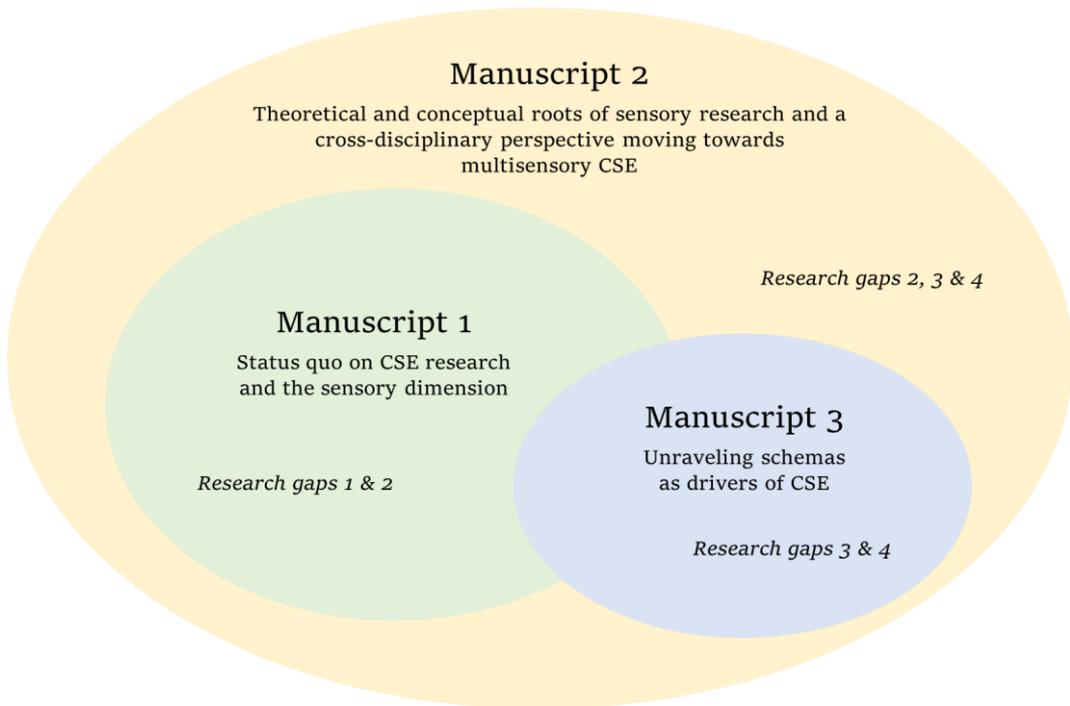


Figure I.1 Research gaps and objectives

Dissertation overview

This dissertation contains three distinct manuscripts in which I unravel the role of senses in shaping CSE. The Introduction provides the foundational baseline. The three manuscripts assemble the pieces along the path to better understand, manage and design CSEs. Depicted in Figure I.2., the manuscripts follow a systematic path: Manuscript 1 (yellow) describes the status quo of CSE research in service and marketing, Manuscript 2 elicits several routes for moving forward (blue), and Manuscript 3 provides the approach and tools for a finer-grained analysis of CSE along the customer journey (green). Table I.1 provides an overview of each chapter.

In Manuscript 1, I conduct an empirical study in which I systematically explore CSE literature with a particular focus on the sensory dimension. In this study, I provide the foundation for my dissertation, highlighting the status quo of CSE research with a perspective on its underlying dimensions:

physical, social, affective, cognitive, and sensorial. I show that the CSE research focus has shifted from brands and products to value and interaction. Although CSE research has investigated four of the five

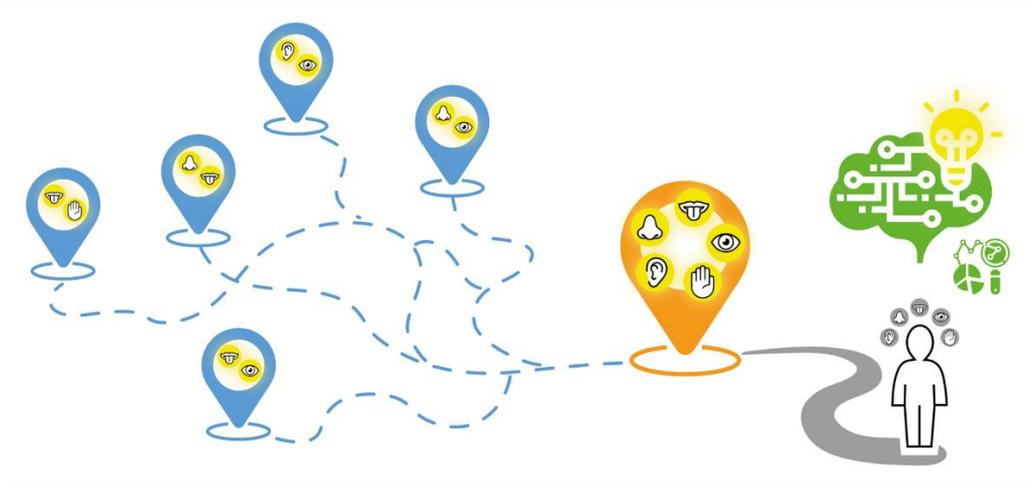


Figure 1.2 Graphical dissertation overview

dimensions of CSE dimensions extensively, it largely has neglected the sensory dimension. The limited number of studies that address the sensory dimension also investigate only one or two senses in isolation; that is, they lack a multisensory focus.

In Manuscript 2, I present a second empirical study that taps deeper into the roots of multisensory CSE research. By employing a mixed-method approach of text mining and co-citation analysis, I shed light on the fragmentary research areas contributing to multisensory understanding. In particular, I explore the theoretical roots and key themes of sensory research in marketing and service and take a multidisciplinary perspective that goes beyond these boundaries. By comparing thematic and theoretical perspectives on sensory research across disciplines, I reveal important gaps in service research. I take a cross-disciplinary perspective to provide a finer-grained understanding of the interplay of senses and their internal processing. I examine key theories and methodologies from neuroscience and cognitive science that are especially relevant to this perspective and that provide fruitful avenues for an integrative service research agenda. Accordingly, Manuscript 2 describes the status quo of sensory research from a cross-disciplinary perspective and develops a multidisciplinary research agenda.

Introduction

Manuscript 1	
Purpose	Describe the status quo of CSE research with particular focus on its underlying dimensions
CSE focus	Phenomenological perspective on CSE and its definitional dimensions (i.e., physical, social, affective, cognitive, sensorial)
Theoretical lenses	<ul style="list-style-type: none">• Service-dominant logic (Vargo and Lusch 2004)• Theory of aesthetics (Aristotle)• Stimulus-organism-response (Mehrabian and Russell 1974)
Research design	Empirical: qualitative network analysis <ul style="list-style-type: none">• Systematic literature review
Method	Text mining
Sample	258 publications that hit keyword selection criteria from 1994–2018
Interdisciplinary focus	Service and marketing
Publication status	Published in <i>Journal of Services Marketing</i>

Table I.1 Overview dissertation manuscripts

Manuscript 2	Manuscript 3
Integrate multidisciplinary conceptual and theoretical roots of sensory research beyond service research's boundaries to generate multisensory CSE understanding and move the service research field forward	Conceptualize multisensory integration in CSE and develop a methodological approach to study this process
Multidisciplinary perspective on sensory dimension of CSE	Zooming in on the multisensory integration that shapes CSE
<ul style="list-style-type: none"> • Service-dominant logic (Vargo and Lusch 2004) • Theories of planned behavior and reasoned action (Ajzen 1991) • Goal-directed attention (Corbetta et al. 2008); stimulus-driven visual attention (Gazzaniga 2011) • Cross-modal correspondence (Spence 2011) 	<ul style="list-style-type: none"> • Attention schema theory (Webb, and Graziano, 2015) • Schema (dis)congruity effect (Noseworthy et al. 2014) • Embodied cognition (Frödin 2017)
Empirical: qualitative mixed-method network analysis	Empirical—qualitative multi-method approach
<ul style="list-style-type: none"> • Systematic literature review • Theoretical root exploration 	<ul style="list-style-type: none"> • In-depth interviews • Card mapping • Photographs
<ul style="list-style-type: none"> • Text mining • Co-citation analysis • Expert validation 	<ul style="list-style-type: none"> • Conceptual development • Ethnographic schema elicitation technique (ESET)
<ul style="list-style-type: none"> • 133 focal service and marketing articles for text mining • 277 multidisciplinary focal articles for text mining • Top 100 most deeply rooted articles for co-citation analysis from service and marketing and multidisciplinary fields 	42 participants, all first-time users
Service, marketing, neuroscience, psychology, food science, and computer science	Service, marketing, psychology, and cognitive science
Submitted to <i>Journal of Service Research</i>	Submitted to <i>Journal of Service Management</i>

In Manuscript 3, I unravel the underlying process that shapes CSE. In this empirical study, I introduce the concept of schemas, which are knowledge structures of existing memories that form our meanings and guide our responses. Schemas can store information at four basic levels: (1) events, such as flying; (2) touchpoints, such as checking in for flights; (3) specific encounters, such as checking in at self-service terminals; and (4) specific activities, such as placing passports upside down at the screen for scanning. In new service environments, we particularly rely on our senses and existing knowledge to familiarize ourselves with services and proceed along the customer journey. Therefore, I conduct an empirical study in a novel servicescape context, using a recently launched mobile self-scanning application for grocery shopping. By taking an ethnographic approach, I disentangle various schemas and examine their effects on CSEs across the customer journey.

Manuscript 1 preface

Making sense of customer service experiences: a text mining review

In a rapidly changing service landscape, service providers face new challenges that require a more sophisticated focus on CSE, beyond the one-time boosting of sales (McColl-Kennedy et al. 2018). The realm of CSE is the next competitive battlefield for service providers, who consistently seek innovative ways to outperform their competitors (Roy 2018). Increasing interest from both practitioners and academics has led to a growing amount of literature on this topic (De Keyser et al. 2015). However, the complexity of each of the five definitional dimensions of CSE has resulted in the fragmentation of CSE research, whereby scholars have investigated the dimensions in isolation (Bustamente and Rubio 2017). Because this fragmentation impedes the development of a holistic understanding of CSE research, it has become increasingly important to establish the status quo of CSE research and develop a more detailed perspective on research efforts in the field.

Accordingly, in Manuscript 1, I conduct an empirical, systematic literature review that depicts research efforts on the topic between 1994 and 2018. I review 258 CSE publications in service and marketing research. In the analysis, I employ a text mining approach that uses Leximancer software to extract research themes and concepts and identify their relationships.

The results of this systematic review demonstrate a shift in focus from a product and brand perspective to an interaction and value perspective in more recent years. By examining in detail the concepts and theories that provide the foundations of CSE research, I identify three focal research areas: service system architecture, with its value creation processes; servicescapes, with an increasingly digital interaction interface; and a focus on CSE outcome measures, with prominent emotional and relational metrics. I also find that CSE research on the physical, social, and cognitive dimensions mostly has investigated those dimensions with regard to the servicescape and in relation to outcome measures. Although important in practice, the sensory dimension is the least investigated dimension of CSE. My synthesis elicits concrete research directions and provides important implications for practice that can guide service providers to control, manage, and design CSE in increasingly complex servicescapes.

Manuscript 2 preface

Toward multisensory customer experiences: a cross-disciplinary bibliometric review and future directions

Following my description in Manuscript 1 of the status quo of CSE research and my finding of a shortage of research on the sensory dimension of CSE, in Manuscript 2 I aim to fill this knowledge gap by conducting a finer-grained analysis of the dimension. I find that not only service research but also the related and well-established marketing discipline has deep roots in sensory research. Extant literature has investigated the effect of environmental stimuli on individual senses, in both offline settings, such as atmospherics in retail stores (Spence et al. 2014) and (increasingly) in online settings, such as webmospherics in e-tailing (Petit et al. 2019). Although these studies provide a foundation for sensory marketing, surprisingly little is known about the interplay and activation of all senses and their effects on perceptual and behavioral outcomes. However, there are many other disciplines, beyond service and marketing literature, that can contribute to an understanding of the role of senses and sensory perceptions. By combining neuroscientific and cognitive science insights with existing service and marketing research, I propose three research directions that can advance the multidisciplinary value of service research by increasing understanding of (1) multisensory stimuli integration and

perception, (2) the role of emotions in multisensory customer experiences, and (3) the influence of multisensory stimuli on behavioral outcomes.

Because it is difficult, if not impossible, to conduct a manual, comprehensive literature review of all studies that have investigated the role of senses, I employ a three-stage, mixed-method approach. Across text mining, co-citation analysis, and interpretation and validation sessions, I generate a holistic, objective portrait of existing sensory research. Following systematic sample selection criteria, I consolidate 133 service and marketing publications and 277 multidisciplinary publications. I undertake a closer analysis of the multidisciplinary pool of publications from four major disciplines that contribute to sensory research: neuroscience, psychology, food science, and computer science. The focal articles in each pool (i.e., service and marketing and multidisciplines) provide the input for the text mining analysis, through which I further consolidate and select my co-citation sample. For the latter, I select the top 100 most cited, deeply rooted publications (Wilden et al. 2017), such that I can explore the theoretical roots of sensory research within service and marketing literature and across other relevant fields. Analyses of the content of the focal articles and the most deeply rooted research provide a good overview of research areas and their underlying theoretical roots.

By systematically analyzing each research pool, I identify three key areas of service and marketing research: (1) atmospherics and sensory perception, (2) service environment and social interaction, and (3) customer- and firm-related outcome measures. My analysis of the multidisciplinary pool reveals three further research areas: (4) sensory processing, (5) food perception, and (6) system interaction. I draw particularly important theoretical lessons from the sensory processing area. Using the insights from this co-citation analysis, I highlight important theoretical and methodological pathways for understanding multisensory CSE.

Manuscript 3 preface

Unraveling customer experiences in new servicescapes: an ethnographic schema elicitation technique (ESET)

In Manuscript 3, I delve deeper into the process of multisensory integration and its role in shaping CSE. The service environment is becoming

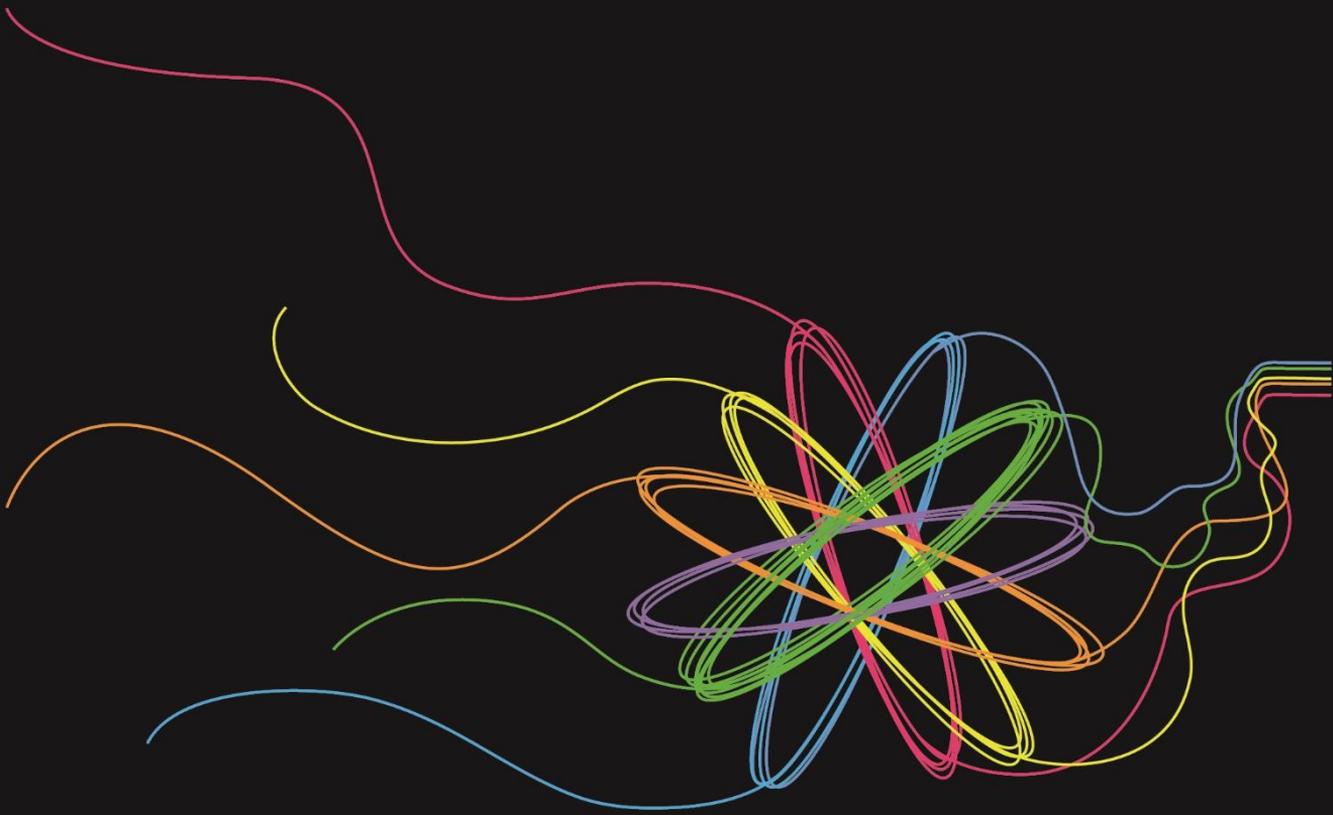
increasingly technology driven and oriented toward self-service (De Keyser et al. 2019); customers must draw on their memories to help them understand and manage this behavioral transition (Dedeoglu et al. 2018). Unfamiliar environments (i.e., new servicescapes) demand high cognitive involvement and make customers more sensitive to sensory information that helps them navigate the customer journey (Spears and Yazdanparast 2014). Drawing on well-established literature streams outside the fields of service and marketing research, I introduce the concept of schemas to disentangle this process. In this dissertation, I define schemas as:

Knowledge structures that constitute past experiences and help customers understand and evaluate service encounters along the customer journey.

Schemas facilitate information at four pyramidal levels: (1) event, consisting of abstract, general information; (2) touchpoints, referring to multiple touchpoints of the event; (3) encounters, which provide more detailed information; and (4) at the most concrete level, information about activities or specific examples. In the conceptual part of Manuscript 3, I develop a framework to explain schematic information processing. It consists of four stages: (1) activation of senses that notice stimuli; (2) matching of stimuli with existing schemas; (3) appraising schemas at the four levels of confirmation, assimilation, accommodation or replacement; and (4) formation of schema-based responses in the forms of cognition, emotions, or behavior.

In the second part of Manuscript 3, I conduct an empirical study in a novel servicescape context to test my conceptual framework. I use an ethnographic schema elicitation technique (ESET) and a multi-method approach that takes a customer perspective and draws on participatory, co-creative, and narrative storytelling activities. I follow 42 first-time users of a novel mobile self-scanning application as they move along their customer journeys, to gather rich, qualitative narratives. My analysis of the narratives and a card-mapping activity reveals six key touchpoints along the customer journey, at which several important schemas are activated and modified. It also shows that appraisal of existing schemas, such as confirmation or modification, profoundly affects customer responses, especially those that are extremely positive or extremely negative. My findings show that by applying the ESET to new self-service technology, service managers can attain competitive advantages in the new battlefield.

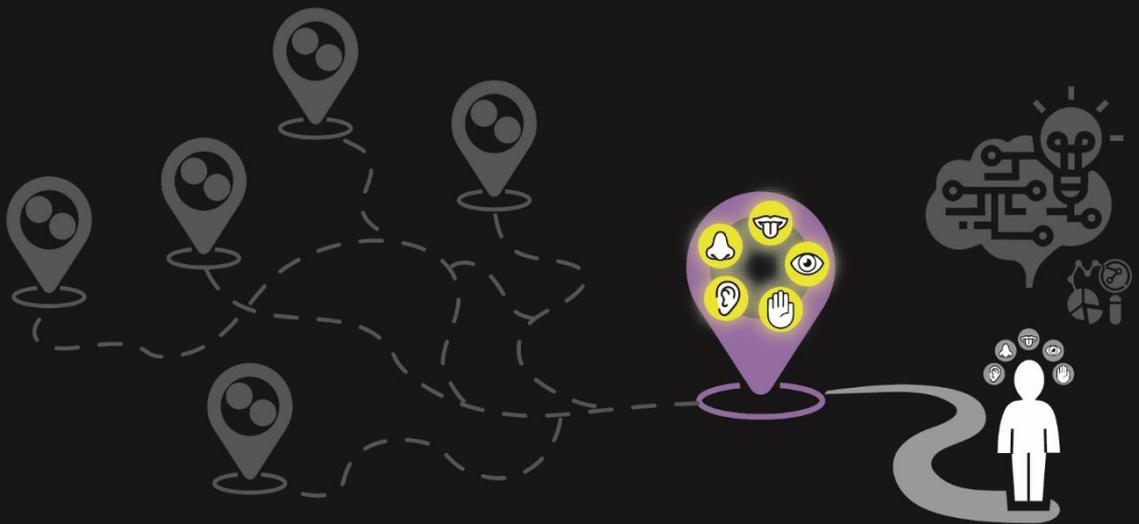
Manuscript 1



Making Sense of Customer Service Experiences: A Text Mining Review

Susan Stead, Dominik Mahr and Gaby Odekerken-Schröder

Department of Marketing and Supply Chain Management, School of Business and Economics, Maastricht University, The Netherlands



Published in Journal of Services Marketing:

Mahr, D., Stead, S., Odekerken-Schröder, G. (2019), "Making sense of customer service experiences: a text mining review", *Journal of Services Marketing*, Vol. 33, No. 1, pp. 88-103.

Introduction

With rapidly changing service landscapes the need to understand, manage and design better customer service experiences (CSE) becomes inevitable for service managers and researchers alike (Roy, 2018). 81% of global marketers' report that they compete mostly on the basis of customer experience (Gartner, 2018). An increasing interest in this topic from both an academic as well as a managerial perspective has led researchers to recognize CSE as a research priority in contemporary services and marketing literature (Bolton *et al.*, 2018; Jaakkola *et al.*, 2015). A plethora of studies have recently emerged in services literature which identify CSE as a complex, multi-layered concept (Berry *et al.*, 2002; Gentile *et al.*, 2007; Helkkula, 2011; Klaus and Maklan, 2012; Lipkin, 2016; Pine and Gilmore, 1998; Schmitt, 1999) and recognize CSE as a cornerstone of marketing (De Keyser *et al.*, 2015). Recent conceptual research on CSE defines it as multidimensional construct consisting of physical, social, cognitive, affective and sensorial elements that encompass the customer's direct or indirect interactions with a (set of) market actor(s) during the entire (purchase) journey (De Keyser *et al.*, 2015; Lemon and Verhoef, 2016).

Despite these significant advancements on the conceptual nature of CSE (De Keyser *et al.*, 2015), a focus on individual dimensions of CSE rather than incorporating all CSE dimensions simultaneously in one research has led to fragmented CSE research (Bustamante and Rubio, 2017; Lipkin, 2016). In the retail context studies strongly contributed to a better understanding of store atmospherics and product choices (Roschk *et al.*, 2017; Yakhelf, 2015). Nevertheless, to the best of our knowledge empirical studies in the services context that have addressed all five suggested dimensions of CSE (i.e. physical, social, cognitive, affective, and sensorial) are limited. Recent studies reveal that particularly little is known about the sensorial dimension of CSE (Bustamante and Rubio, 2017; Keiningham *et al.*, 2017). This seems at odds with findings from consumer behavior studies where scholars over the past decade reveal the importance of visual, auditory, olfactory, taste, and habitual stimuli on CSE in the retail context (Berry *et al.*, 2002; Gentile *et al.*, 2007; Holbrook and Hirschmann, 1982; Yakhelf, 2015). In a similar vein, a large variety of marketing studies has altered the servicescape to trigger sensory effects through aesthetical

appeal, scents, music jingles, food samples, and surface roughness (Krishna, 2012; Mattila and Wirtz, 2001). Drawing on other literature domains such as psychology, neuroscience, and cognitive science also provides diverse and rich insights about senses. However, the large variety and scattered foci impede CSE researchers to manually synthesize and translate these contributions to the services context.

In this manuscript we focus on the most recent conceptualization of CSE with its five corresponding dimensions. The aim of this study is to synthesize the rapidly growing contributions about CSE and its five dimensions across leading journals in the services and marketing domain. The following research questions guide our investigation:

- (RQ 1) What is the conceptual structure of CSE and how has it evolved over time?
- (RQ 2) What theoretical concepts distinguish the five definitional dimensions of CSE?
- (RQ 3) To what extent is the sensorial dimension present in CSE research?
- (RQ 4) What concepts and theories of sensorial CSE cut the boundaries of services and marketing research and offer opportunities for future research?

Key motivations for this research are the need to understand, design and evaluate the five definitional dimensions of CSE as well as the opportunity to provide directions for service researchers to further advance this emerging field (De Keyser *et al.*, 2015; Lemon and Verhoef, 2016; Lipkin, 2016; McColl-Kennedy *et al.*, 2015). Using a novel text mining and topic modelling approach, we extract and consolidate the concepts and focal dimensions across a large set of articles in a rigorous, automated, and systematic way. This is especially suitable for studying complex phenomena in an unbiased and content-driven format (Biesenthal and Wilden, 2014) when contributions are cross-disciplinary, which is the case for CSE. The approach extracts word occurrences and applies a Bayesian algorithm to predict emerging concepts and their relationships. This helps to understand the research area, its development, and research opportunities in the services marketing domain. In doing so, the article identifies important pathways to advance services research and CSE in

particular. It also guides future research studies that ultimately help service managers to design services that create richer multisensory experiences.

Theoretical background

CSE and its underlying dimensions

Multiple definitions on CSE exist across services and marketing literature. This article focusses on the currently most accepted definition that considers CSE to consist of a physical, social, cognitive, affective and sensorial dimension (for further discussion we refer to Lemon and Verhoef, 2016). Understanding the multidimensionality of CSE is a central focus of emerging bodies of services, marketing, and management literature (Lemon and Verhoef, 2016). Although there is widespread contemporary agreement on the importance of the concept of CSE, there are still divergent views on what constitutes CSE. In the last decades, various research disciplines presented an increasing number of scholarly articles showing different perspectives on (re-) defining, analyzing, and capturing CSE (e.g. De Keyser *et al.*, 2015; Helkkula, 2011; Klaus and Maklan, 2012; Lemon and Verhoef, 2016; Lipkin, 2016; Roy, 2018).

Reviewing these different perspectives on CSE research helps to understand how scholars derive at the five dimensions (physical, social, cognitive, affective, and sensorial) of CSE. Literature reviews on CSE by Helkkula (2011) and Lipkin (2016) reveal that different theoretical lenses led to diverging approaches and characterizations of CSE. Helkkula (2011) views CSE literature as either *process*-based (i.e. papers concerned with the service system architecture), *outcome*-based (i.e. papers operationalizing outcome qualities), or *phenomenon*-based (i.e. papers view CSE as a holistic context-specific phenomenon). In contrast, Lipkin (2016) classifies CSE literature according to three levels of customer activity within the service environment. The first and most traditional perspective is *stimulus-based*, which refers to a passive response by the individual to largely controlled and created stimuli offered by the provider (Lipkin, 2016). This so called Stimulus-Organism-Response (S-O-R) paradigm (Mehrabian and Russell, 1974) provides the theoretical grounds for these studies. The paradigm postulates that stimuli in the servicescape have an impact on customer

perceptions (organism), which leads to particular customer reactions (responses). Some literature criticized the S-O-R model, since it considers customers to be in a rather passive state, implying that experiences are formed in an automated process (Pareigis *et al.*, 2012; Lipkin, 2016).

The second *interaction-based* perspective extends the previous perception and views customers as active individuals that subjectively assess social interactions (Edvardsson *et al.*, 2005; Pareigis *et al.*, 2012). Studies classified as interaction-based have overcome previous limitations and identify the customer's active role in sensing *and* interpreting the servicescape. This sensing and interpretation is driven by prior experiences (Lipkin, 2016). According to Lipkin (2016), the shortcoming of the interaction-based approaches is the linear and temporal perspective that investigates CSE.

The third and most recent and advanced perception of CSE according to Lipkin (2016) is the *sense-making-based* perspective. In this view, studies understand CSE as a holistic and dynamic concept that requires iterative sense-making processes (Heinonen *et al.*, 2013). Studies that apply this perspective investigate visible and invisible interactions within the servicescape (Bolton *et al.*, 2014; Carú and Cova, 2015) with a large focus on the customer's inner realism. Furthermore, customers understand the servicescape in terms of physical and social realities by engaging in cognitive and affective processes (Lipkin, 2016). It is notable that the sensory dimension remains rather absent in this sense-making perspective. Outside the services context studies on atmospherics reveal that environmental stimuli typically activate cognitive and affective processes (Roschk *et al.*, 2017). However, the question of how and why customers react to environmental stimuli still remains unexplored (Rosenbaum and Massiah, 2011). Since invisible inner realism (Helkkula and Kelleher, 2010) to a large extent determines the cognitive and affective CSE dimensions, CSE may not always be externally observable. Spence *et al.* (2014) suggest that the sense-making process is a complex mechanism by which experiences are not only transported by affective and cognitive iterations, but also to a large extent by sensorial iterations. The resulting perceptions cannot be understood on a sense-by-sense basis, but are the result of a multitude of cues in the servicescape that lead to a multisensory perception (Krishna, 2012). This implies that customers selectively transfer

multisensory cues by means of their senses into cognitive and affective perceptions (Spence *et al.*, 2014). This complexity of inner realism makes it particularly difficult for services and marketing researchers to understand and capture the connected and holistic sensory experience in a complex service environment (Scott and Uncles, 2018). Given that senses play an important role in shaping CSE, we believe that particularly the services discipline would benefit from a clear conceptualization of the sensory dimension.

Sensory dimension of CSE

When studying a concept as complex and interwoven as senses, it is essential to increase the understanding of how such phenomena come to be and what constitutes them. Consumer behavior, psychology, and neuroscience research have extensively studied senses (Driver and Spencer, 2000; Streicher and Estes, 2016; Sunderland *et al.*, 2012). To derive a common understanding of what senses and sensory perception entail, this article therefore first draws on well-established research beyond services literature.

Krishna (2012, p. 334) distinguishes between sensory stimuli and perception. Sensory stimuli are “stimuli that impinge upon the receptor cells of a sensory organ” and may appear as visual, auditory, olfactory, taste, or habitual cues. Perception on the other hand, is an “awareness or understanding of sensory information,” which can be sensory, cognitive, or affective. The concept of senses goes as far back as Aristotle. He introduced the theory of aesthesis (i.e., sensation) somewhere in the fourth century. Aristotle argued that the order of senses is hierarchically, starting with haptics, and then all other senses increase the acuity of the touch sensation (Krishna, 2012). Later studies indicate that human perceptual systems can receive multiple sensory signals simultaneously, which can form in isolation or in combination as a starting point for further interpretation (Agapito *et al.*, 2013).

Consumer behavior research relies extensively on insights of combined senses to assess product perceptions. For example, Orth and Malkewitz (2008) demonstrate the key role of vision and haptics for discovering changes in the environment and understanding product perceptions. Garlin and Owen (2006) also find a link between auditory impressions of sound with emotions and feelings that consumers use as cues to interpret their

experience (Hultén, 2011). In contrast, Dinh *et al.* (1999) show that olfactory and tactile cues increase customers' sense of the presence of and their memory of a virtually depicted and perceived environment. Finally, the sense of taste is distinct and usually assessed in combination with other senses, because humans can only distinguish five pure tastes (sweet, salty, sour, bitter, and umami), so any inferred evaluation relies on a combination of sensory perceptions (Krishna, 2012). Ghanzanfar and Schroeder (2006) also find that the integration of senses across receptors (i.e. eyes, ears, nose, skin, taste) depends on the congruency of the stimulus signals. Rich stimulations from different sources that occur simultaneously appear to refer to the same event (Driver and Spence, 2000). Against this academic background, substantial research in psychology and marketing highlights the impact of sensory stimuli or cues on customers' product perceptions.

However, in a services context, it is less obvious what role senses play in CSE formation (Scott and Uncles, 2018). In the broadest sense, services literature refers to the sensory dimension as the sense-making process of the customer when interacting with the physical service environment (Bitner, 1992). Berry *et al.* (2006) were among the few scholars who integrate the concept of sensory perception into a conceptual model. The authors capture senses within a *mechanic clues* dimension, which refers to environmental stimuli such as sights, smells, sounds, tastes, and textures. This dimension is distinct from *functional clues* that pertain to the technical quality of the offering, *human clues* that emerge from the behavior and appearance of the service provider.

Building on these insights, Palmer (2010) later defines sensory stimuli in a way that is more centralized to the overall service experience, using a definition by Gupta and Vajic (2000) that states that CSE results from any sensation or knowledge that the customer derives from an interaction with different elements in the context created by the service provider. Palmer (2010) confirms the importance of the services context as a driver of CSE but also suggests that customers perceive sensory stimuli uniquely and different from other customers. This applies to sensory perceptions in isolation as well as in combination. In fact, cues in a services context often are perceived as multisensory stimuli, e.g., a combination of taste and smell, such that a combination of senses drive cognitive and affective perceptions (Krishna and Schwarz, 2014; Sunderland *et al.*, 2012; Yanagisawa and Takatsuji, 2015).

Although the contributions of marketing and psychology research led to a clearer understanding of multisensory perception, these studies mostly adopt a product perspective, but still much work needs to be done in understanding the impact of multisensory customer *service* experiences (Keiningham *et al.*, 2017; Scott and Uncles, 2018). In line with this Krishna (2012) shows how subconscious triggers that appeal to customers' senses affect their perceptions and induced behavior; substantial literature also identifies the effects of senses on customers' purchasing behavior (e.g., Adolphs *et al.*, 2000; Bolton *et al.*, 2014; Peck and Childers, 2008). In particular, Yanagisawa and Takatsuji (2015) note that sensory stimuli lead to multisensory perceptions, which affect posterior emotions. This finding suggests that sensory stimuli drive cognitive and affective perceptions of CSE. Yet there is no universally accepted or integrated conceptualization of the sensory dimension in a CSE research.

In the services context in particular, reliance on sensory cues is crucial; services do not offer any tangible cues that customers can use to judge the experience (Kwon and Rashmi, 2018). In fact, sensations that are derived from sensory organs (i.e. eyes, ears, nose, skin and taste receptors) and “act as the initiator of individual's perception of the surrounding world, a process through which sensory inputs are selected, organized, and interpreted, resulting in a conscious sensory experience” (Agapito *et al.*, 2014, p. 225). In addition, empirical studies emphasize the importance of the sensory dimension over the other four dimensions of CSE which indicates the role of senses as key for value creation processes in the servicescape (Agapito *et al.*, 2014; Brakus *et al.*, 2009; Gentile *et al.*, 2007). Thus, it is essential to broaden perspectives on this topic and draw on well-established marketing and psychology research streams to cross research boundaries and shed some light on this complex but utmost relevant dimension of CSE.

Methodology

CSE gained prominence in the services and marketing discipline over the past years, with a broad set of published studies (Bustamante and Rubio, 2017). To consolidate scholarly understanding about the concept and its underlying foundations, initial papers have reviewed the concept. However, they either did not follow a systematic approach or based their

analysis on manual coding (e.g., Lipkin, 2016) which might be subject to researcher bias (Wilden *et al.*, 2017). The current study uses a systematic text mining and machine learning approach with the aim to expand the scale and scope of existing CSE reviews. Text mining is a form of unstructured ontological discovery (Randhawa *et al.*, 2016) that consolidates concepts and themes across a large set of articles in a rigorous, automated, and systematic way, especially suitable for studying complex phenomena in an unbiased and content-driven format (Biesenthal and Wilden, 2014).

This article makes use of Leximancer 4.0 that applies a Bayesian learning algorithm to identify word co-occurrence frequencies and the relationship in the text corpus and that has been employed in other contexts. Put simply, words that occur frequently make up a concept. Concepts that co-occur often within the same sentence are clustered in close proximity and are grouped to a theme (Cretchley *et al.*, 2010). Thus, the themes explain the groupings of the clusters and are named after the most prominent concept in the cluster. Leximancer uses a clustering algorithm that outperforms approaches such as Latent Dirichlet Allocation (LDA) in such a way that it does not decide on the number of themes prior to the analysis, but rather selects the number of themes through a machine-learning algorithm based on the discovered concepts and their relationships (Wilden *et al.*, 2017).

Sample selection

In order to comprehend the status quo and evolution of CSE research rooted in marketing and emerging services literature, we used Thompson Reuters' *InCite Citation Index* and *Web of Science* to identify relevant journals and CSE articles. The citation index allowed us to identify peer-reviewed services and marketing journals which were ranked according to impact factor. For our analysis we included services and marketing journals with a five-year impact factor higher than one ($IF > 1$). In total 16 services journals and 27 marketing journals met the initial criteria and were consolidated based on four main criteria that are outlined in the next section.

In a next step, a keyword search in *Web of Science* included all 43 journals. For the selection of keywords, we made use of a peer discussion with

experienced researchers in the field. As a result, we defined a list of most relevant keywords for CSE research, which were used in an issue-by-issue search of all selected journals. The search followed in two stages. First, we searched in all journals for the terms “customer experience”, “user experience”, “service experience” or “experience centric service” in the title, abstract, and keyword section. This restriction ensured that CSE was the focal concept in the articles. Since we were particularly interested in the sensory dimension of CSE, in the second search step we investigated the same set of journals by employing a search for the following combination of words “senses AND experience” or “sensory AND experience” or “sensorial AND experience” or “multisensory AND experience” or “multi-sensory AND experience”.

Given the aim of this article the results of this search served to generate a comprehensive list of papers that have been conducted in the array of CSE literature across all times and, in addition, reveal those papers that have contributed to the sensory dimension. Thus, for an article to be included the following criteria had to be met: (1) published in English language, (2) contains at least one of the search words in the title, abstract or keyword section, (3) published and available in any online archive or database, and, (4) considered a full article (e.g. call for papers, abstract or proceeding were not included).

The search resulted in an initial set of 331 articles of which 151 belong to marketing journals and 180 to services journals (see Figure 1.1). The authors independently scanned all 331 articles to ensure that they met the inclusion criteria and that the focal concept was CSE and/or the concept of senses in the context of CSE. In particular, the articles had to meet one of the following criteria: the article provides a definition on CSE or senses; provides a conceptualization of CSE or senses; provides dimensions of CSE or senses. The coding resulted in an overlap of 93%. For the articles where the coders did not come to an agreement a third, independent coder was involved. This coding process led to a final sample of 258 articles (73 excluded). Of these 258 articles 206 CSE articles resulted from the first search and 52 senses related articles resulted from the second search.

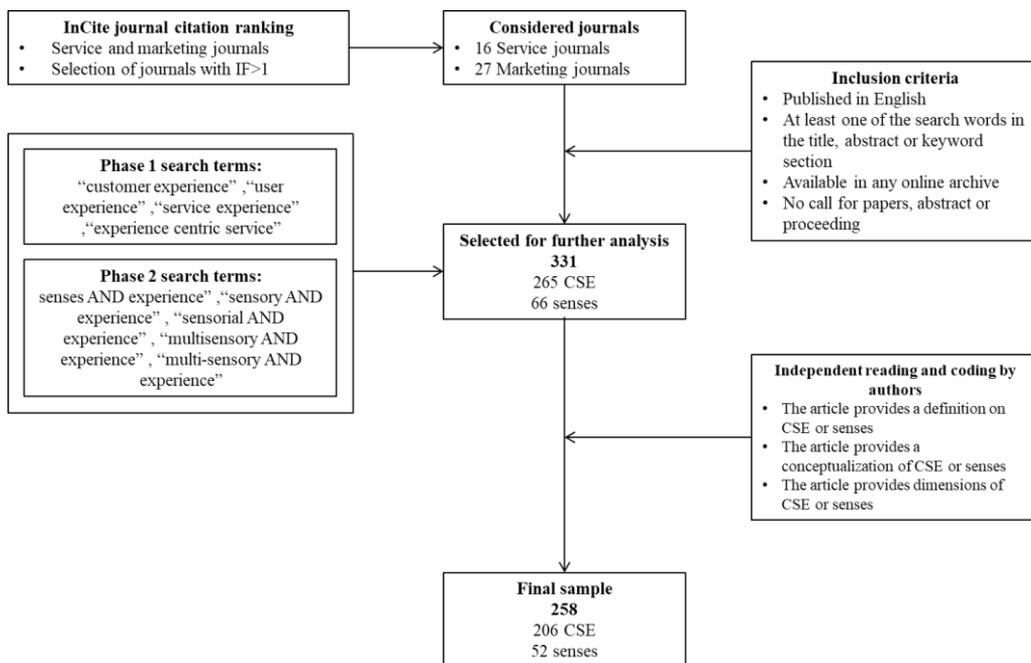


Figure 1.1 Overview of systematic literature review

Text mining analysis

The first two steps in the data analysis phase included downloading all 258 articles from the journal database and converting PDFs into Microsoft Word files. This step removed reference lists and any headers and footers stating the article title, journal name, authors or year of publication and page numbers to avoid causing meaningless or biasing co-occurrences of words after running the analysis (Netzer *et al.*, 2012).

The data set was then clustered into publications on CSE that occurred between 1994 - 2008 and 2009 - 2018. The first publication that matched our search criteria was found in 1994. Drawing on Lemon and Verhoef’s (2016) influential article, the authors find that although Schmitt (1999) already identified five types of experiences (i.e. sensory (sense), affective (feel), cognitive (think), physical (act), and social-identity (relate) experiences, only ten years later Brakus *et al.* (2009) introduced the sensory dimension as the fifth dimension to the CSE definition. We therefore anticipate a potential conceptual shift in CSE research as of 2009. For the 52 articles that matched our sensory keyword search we did not split the set into different time frames as our intention was to reveal a

detailed overview of key concepts that can help define the multisensory dimension in CSE research.

The analysis with Leximancer resulted in a semantic extraction of thesaurus of words that carry related meanings and form a theme (Randhawa *et al.*, 2016). Thus, the outputs the software procures are visual and tabular representation of concepts, themes and their relationships (Liesch *et al.*, 2011). As such, the software identifies closely related concepts and clusters them in a theme. The relative size and color refer to the relative importance of the themes, following the color wheel with red determining the most important theme. The distance between concepts gives an indication on the semantic relationship, meaning strongly connected concepts appear in close proximity (Smith and Humphreys, 2006). In addition, interpreting the graphical depiction, an important element to consider is the presence or, in particular, absence of a concept. Following Liesch *et al.*'s (2011, p. 25) reasoning, it may be “potentially instructive if important concepts fail to occur sufficiently frequently within the text to be identified and associated with other concepts”. Although Leximancer follows an unsupervised learning algorithm, thesaurus creation through e.g., concept seed word cleaning, classification of conceptually synonymous concepts, as well as the interpretation of the graphical depiction is still important actions that are taken by the researcher.

We excluded general terms (such as *research*, *results*, *showed*, *significant*, *model* etc.) which are commonly used throughout articles, but do not specifically add meaning to the content analysis (Cretchley *et al.*, 2010). In addition, singular and plural words were merged (such as *environment* and *environments*). Finally, we excluded our search terms “customer”, “experience”, and “service” as they would logically dominate the results and could blur underlying concepts and themes of CSE we are interested in.

Findings

Evolution of themes and concepts in CSE research

Comparing and interpreting the graphical depiction and tabular insights from CSE publications between 1994-2008 (T1) and 2009-2018 (T2) addresses the first research question. Specifically, we interpret themes and concepts as well as their semantic distance and read samples from the focal

articles that form these themes (Randhawa *et al.*, 2016). To understand how the field of CSE research has evolved, we investigate whether themes and prominent concepts have changed.

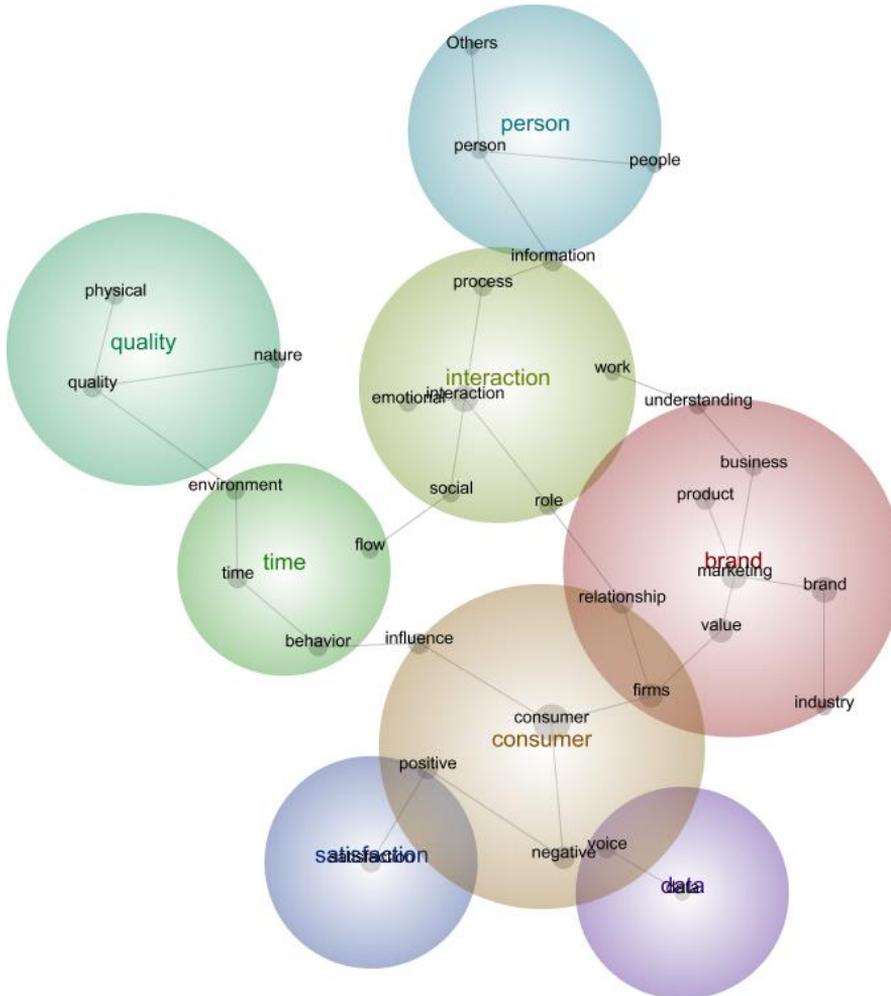


Figure 1.2 Time 1 (T1: 1994-2008)

First, investigating T1 (n=31) the semantically closely related and most noticeable themes are *brand* and *consumer* and to a slightly lesser extent *interaction* (see Figure 1.2), indicating a strong provider- and product-centric focus. Specifically, the most dominant theme *brand* in T1 is consisting of concepts such as marketing, business, firms, and industry. The

close proximity of the concepts product, brand, and value support this product-centricity. The connection to the second most prominent theme *consumer* can be observed through the concepts firm and relationship. Furthermore, central concepts in these customer-firm relationship studies are consumer satisfaction, and positive and negative evaluations as outcome variables (Patrício *et al.*, 2011). According to Palmer (2010) customer satisfaction and quality have been criticized for their shortcomings in predicting purchasing behavior and bias towards cognitive rather than affective outcomes.

With the development of the service-dominant (S-D) logic (Vargo and Lusch, 2004; 2008) within the time period of T1, not only customer-centricity but also broader perspectives on the servicescape and service interactions became prominent (Lipkin, 2016; Nenonen *et al.*, 2018; Rosenbaum and Massiah, 2011). The themes *interaction*, and *quality* include three of five CSE dimensions: physical, social, and affective (i.e. emotional). The emotional and social dimensions are mostly associated with *interaction*, whereas the physical dimension connects to quality.

As a rather new and fast emerging research area, it is not surprising that the large majority of CSE articles (n=175) fall under the second time period: 2009-2018 (T2). Two formative CSE studies appeared in 2009 and 2010, which demonstrate the change and broadening of the research focus (Brakus *et al.*, 2009; Zomerdijk and Voss, 2010). Their CSE definitions now encompass the sensory dimension as the fifth dimension. In addition, CSE has shifted from a dyadic provider-customer focus to a much broader concept that is subject to the influence by the interaction within the servicescape with contextual stimuli, not necessarily controlled by the provider (Rosenbaum and Massiah, 2011). In this vein, CSE is understood to be shaped on the basis of physical, social, cognitive, affective and sensory perceptions (Bolton *et al.*, 2014).

In line with these changes several new themes emerge in T2. Zooming into the conceptual map of Figure 1.3, we identify three key areas of CSE research that enable understanding the evolution and the current state of CSE research. Figure 1.3 shows the key areas through three circles which summarize concepts relating to the *service system architecture* (circle A) (see e.g. Patrício *et al.*, 2011), *servicescape* (see e.g. Bitner, 1992; Rosenbaum and Massiah, 2011) (circle B), and *outcome measures* (see e.g. Helkkula, 2011) (circle C). The following explains each research area further.

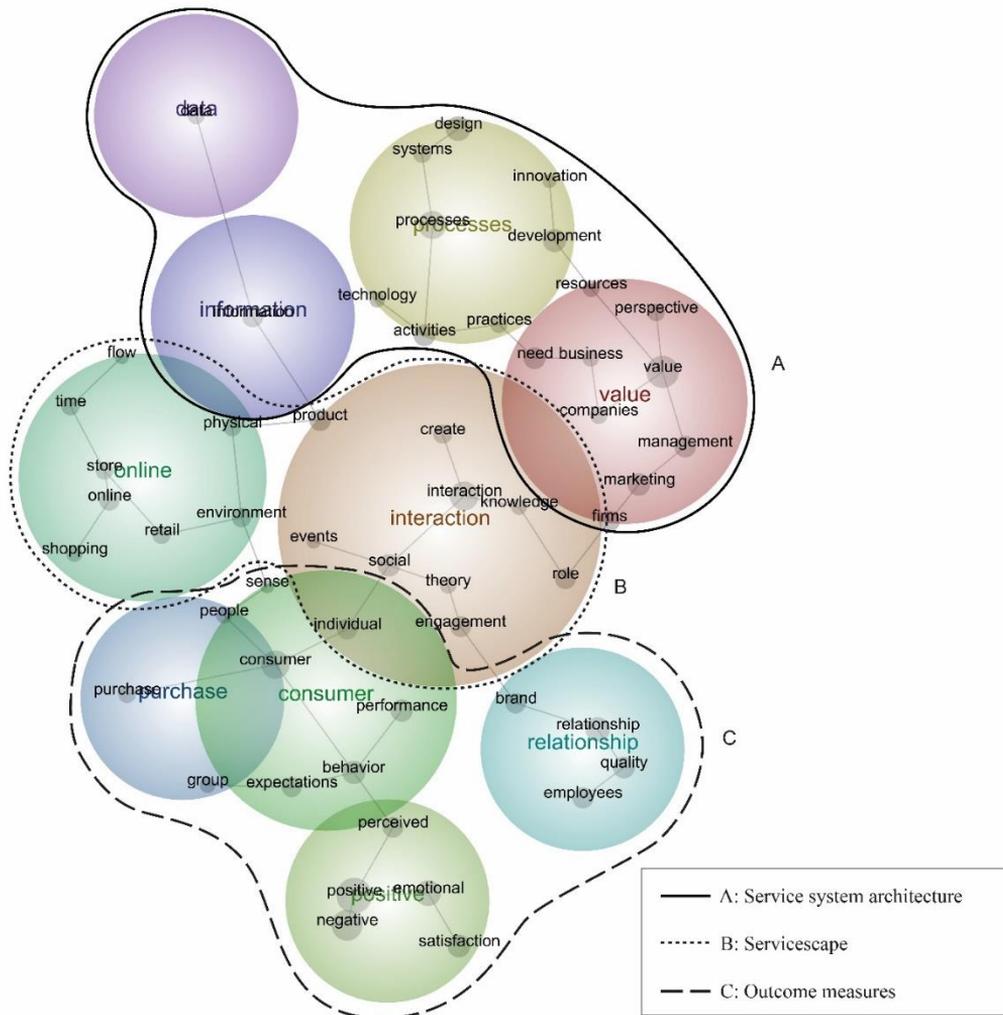


Figure 1.3 Time 2 (T2: 2009 - 2018)

Service system architecture

Research on *service system architecture* focuses mostly on two dominant themes: *value* and *processes*. The themes *data* and *information* are somewhat distant but can be seen as support processes. Surprisingly, in T2 the theme *value* is now detached from the *consumer* theme and dominantly connected to provider related concepts. In close proximity are concepts such as company, management, marketing. Additional concepts are resources and perspectives. Furthermore, the closely connected concepts of business, companies, and need as well as perspective and resources link to

the second largest theme *processes*, which is described by concepts such as systems, technology, activity, and practices, but also innovation and development. The in relatively close proximity occurring concepts design, system, innovation, and development constitute an important change to T1 and have been identified as key concepts for creating meaningful value propositions (Yu and Sangiori, 2017).

Different from T1 where processes (showing as a concept) appear scarcely addressed under the theme of *interaction*, now directly link to the theme *value* and more distant to the theme *interaction*. Furthermore, an interesting finding is that in contrast to T1, the theme *brand* and the concept relationship is no longer in close proximity to the theme *value*. Instead, in T2 brand is now a concept under the separate theme *relationship*, which can be considered as an *outcome measure* of CSE (circle C).

Servicescape

The second area of research identified constitutes concepts that focus on the *servicescape*. The servicescape is defined as a physical setting in which a service exchange is performed, delivered and consumed (Bitner, 1992). *Interaction* and *online* are the two central themes that emerge from the analysis of T2, where *interaction* can be considered as the key activity in CSE research, which is taking place in the servicescape (Patrício *et al.*, 2011). Additional concepts are role, create, and knowledge. Comparing T1 and T2 the concept role is one of the few that remains rather stable in size and position, captured in both T1 and T2 under the theme *interaction* and in close proximity to the provider-related concepts, indicating a rather stable research interest. This finding supports the notion of redefining actors' roles in the servicescape (Patrício *et al.*, 2011). Under the service logic, it has been shown that the actors' knowledge and understanding of their role in the servicescape significantly influence value creation processes (Moeller *et al.*, 2013; Wetter-Edman *et al.*, 2014). Interestingly, the social dimension of CSE links to theory, which in turn links to engagement. In line with this, engagement theory has recently been shown to understand and refine actors' engagement in the servicescape (Li *et al.*, 2018). Also engagement and the individual constitute dominant concepts that bridge the servicescape themes with *outcome measure* themes.

The second most dominant theme in the servicescape online is an important change to the servicescape literature in general. Online did not emerge as

a concept in the analysis of T1, but forms now a relatively large theme under T2. Time and flow are two concepts that in combination with store, shopping and retail concepts represent the shift towards an online environment in the retailing industry. In comparison to T1, where the physical dimension was a concept of quality, T2 observes a strong shift towards an online environment.

Outcome measures

In the third research area that describes as *outcome measures*, the themes that emerge are *consumer*, *relationship*, *purchase* and *positive* (Figure 1.3). While *consumer* and *purchase* are clustered in close proximity, concepts such as expectations, behavior, performance, and purchase shape these themes. In line with Helkkula's (2011) characterizations, these studies expand the scope of CSE towards largely measurable outcome variables or attributes against which the present CSE is assessed. Furthermore, we find a link between consumer and perception, positive and negative evaluations and satisfaction (Svari *et al.*, 2011). Interestingly, satisfaction receives less attention in T2 as opposed to T1 where it is a theme itself. Additionally, the concept of emotions shifts from the servicescape, where it closely linked to *interaction*, towards an outcome measure concept. In addition, the concept sense appears under the *consumer* theme and closely connect with the environment concept in the servicescape.

In T2 a new theme labelled as *relationship* emerges. Amongst others, brand, quality and employees play a central role in relationship building and maintaining (Nguyen *et al.*, 2014). In particular, quality and brand have received far less research attention in comparison to T1.

The five dimensions of CSE

In order to answer the second research question, we compared and assessed the five dimensions of CSE across both time periods. As outlined in the methodology section, the sensory dimension appeared in CSE definitions only as of 2009, whereas earlier CSE studies addressed the other four dimensions (Lemon and Verhoef, 2016). Interestingly, when investigating Figure 1.2 (T1), only three (social, affective and physical) of five dimensions appear as concepts. While under the *interaction* theme social and affective factors seem to play a large role, the physical dimension ties in with the theme *quality*. Surprisingly, the cognitive dimension (and as anticipated the sensory dimension) is absent. More importantly

however, in T2 (Figure 1.3) an indication for four of five dimensions can be found. The physical dimension is closely connected to the environment, whereas the social dimension remains a key concept of interaction. In contrast, the affective dimension (i.e. emotion) has shifted towards consumer evaluations that are measurable as CSE outcomes.

The concept sense is somewhat positioned between the *online* and *interaction* theme at the edge of the *consumer* theme circle. Since the concept is not stating “sensory” directly and it could infer multiple meanings, an additional investigation was conducted. Reading text examples provided insights that the concept sense relates to both sensing and senses. Thus, we find a connection between the (online) environment and consumer senses, but no sensory dimension. Surprisingly, the cognitive dimension remains absent in the output of T1 and T2, indicating that no or limited attention has been paid to this dimension. Since the aim of the third and fourth research question focused on the sensory dimension we conducted a second text mining analysis.

Multisensory CSE

In the second step of the analysis papers that focus on the sensory dimension (n=52) are investigated. The analysis of these articles enables answering the third and fourth research question. First, in Figure 1.4, *product* reveals as the most dominant theme. In contrast, service is only found to be a small concept under the theme *experience* indicating rather limited attention in sensory experience research. The sensory concept is the most prominent and closest connected concept under the theme *product* (Figure 1.4). Furthermore, all five human senses are in relatively close proximity to the theme *product* as opposed to *experience* or the service concept. Vision and touch constitute concepts of *product* and are closely related to packaging, association, and perception. Somewhat unrelated to the *product* theme, *sound* (i.e. hearing) and *taste* are considered individual themes. *Taste* is additionally strongly related to the concept smell and food, indicating that studies have focused on these two senses in a food context conjointly (Krishna, 2012). Another interesting finding is that the theme *sound* is related to color, which appears separately from vision, which in turn is closely connected to the theme *brands*. Furthermore, Figure 1.4 reveals that in contrast to Figure 1.2 (T1) and Figure 1.3 (T2), all five dimensions of CSE are visible. This indicates that studies that investigate the sensory dimension of CSE also consider the other four dimensions.

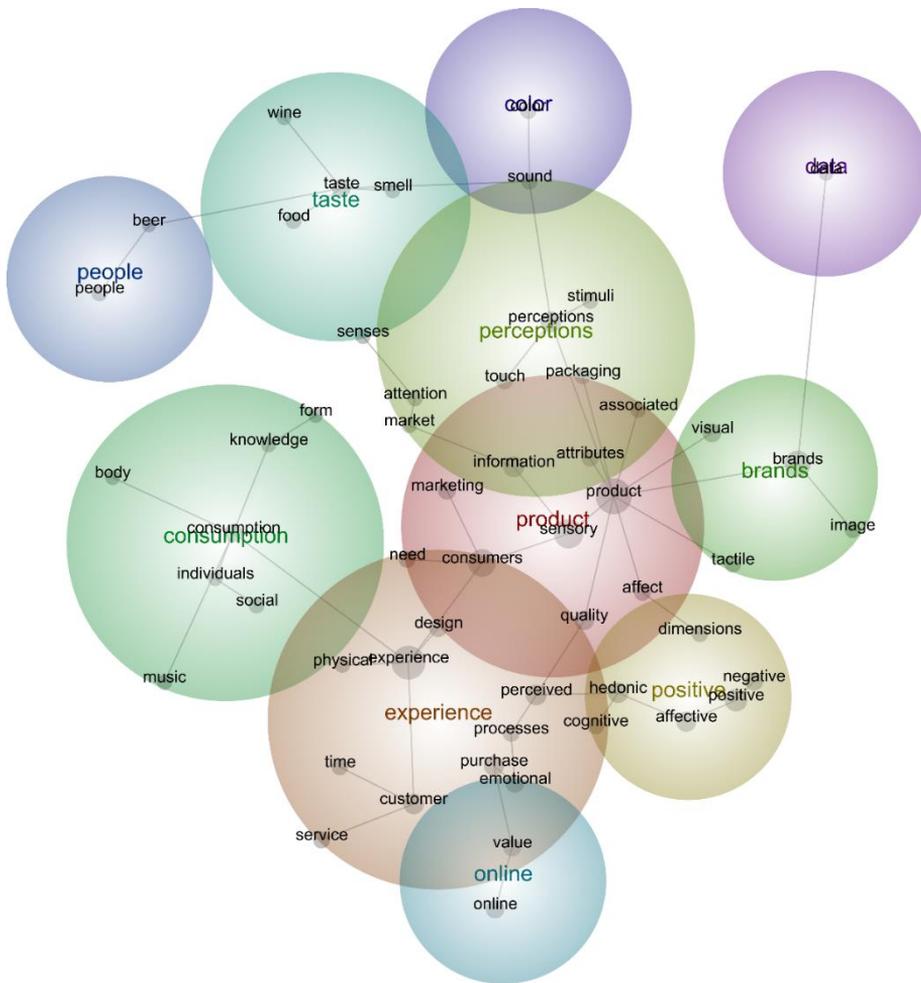


Figure 1.4 Sensory experience research

In contrast to the five human senses, which are mostly investigated with products and brands, four of five CSE dimensions occur adjacent to the theme *experience*. In particular, under the theme *experience*, the concepts emotion and cognition appear. Surprisingly, cognition is linked to *positive* (a theme that relates to *outcome measures*) and *experiences*, indicating importance in both areas. The *social* dimension forms a separate theme, constituting solely of the concept physical. Both dimensions (i.e. social and physical) connect to *experience*. In contrast, emotions closely relate to processes and purchase, which are *outcome measures* (see Figure 1.3, T2). In a similar vein, the concept affective, which consists of emotions, closely relates to the theme *brand* and *product*; concepts such as positive, negative, and quality occur nearby.

Surprisingly, of all five dimensions only the sensory concept does not directly link to *experiences* or *service*. In fact, the sensory concept links to consumers, which is a concept that is part of both themes: *product* and *experience*. In Figure 1.4, the concept of ‘customer’ is mostly associated with services, whereas ‘consumer’ is closer connected to products. The distance between the sensory concept and the themes *service* and *experience* hints towards limited research attention in the service literature. This finding is supporting the observation across T1 and T2, where the sensory dimension is absent.

The analysis of the sensory literature shows that the sensory dimension relates strongly to information, indicating that information is retrieved through sensory processing (i.e. through human senses). Senses cluster as a concept under the theme of *consumption*, indicating an important role for consumption processes. Furthermore, vision and touch (in theme *product*) closely link to perception and association.

Discussion and implications

This study identifies pathways for developing CSE research with its central concepts and its dimensions (Bustamante and Rubio, 2017). In particular, the sensory dimension in the CSE research remains a key challenge for researchers and practitioners (Scott and Uncles, 2018). The text mining analysis offers a novel approach in analyzing diverse contributions to CSE research over time and identifies three distinct research areas of CSE: *service system architecture*, *servicescape*, and *outcome measures*.

The findings clearly reveal a lack of research attention on CSE’s five fundamental definitional dimensions (i.e. physical, social, cognitive, affective and sensorial). In fact, only the physical, social and affective dimensions are found consistently across both time periods (Figure 1.2 and 1.3), with an indication for the sensory dimension in T2. The social and physical dimensions constitute important concepts of a fundamental change between T1 and T2, where a shift from product and firm perspectives in T1 towards interaction and value creation in T2 can be observed. These observations lend support to the suggested shift from manufacturing-dominated economies, where experiences involve customers who transform tangible products into value (Palmer, 2010; Schouten *et al.*, 2007; Vargo and Lusch, 2004). Recently, service

ecosystems are seen as more dynamic (Wilden *et al.*, 2017), where particularly the servicescape should facilitate richer value creation.

In a similar vein, the analysis reveals that most research attention lies on the processes (Figure 1.3 circle A) that support the value propositions (circle B) and the interaction within the servicescape (circle B). Andreassen *et al.* (2016) suggest that designing value creating services demands from the provider to understand processes and contexts that influence CSE. This means that firms should develop value propositions and constellations from which the customers can derive value (Gupta and Vaijic, 2000). The close connection between *value* and *processes* is further elevated in service design, an approach that has received increasingly attention in the services literature over the past years (Antons and Breidbach, 2018). Service design emerges as an approach that enables organizations to communicate, plan, and organize people and resources in order to develop better services (Mager, 2009).

Furthermore, the findings suggest that although the link between processes and value is important, the role of the customer seems somewhat neglected, which is indicated by the distance between the themes (Figure 1.3). This may be seen as contradictory to the S-D logic's foundational premises (FP) 6 stating that "value is cocreated by multiple actors, always including the beneficiary" and FP7: "actors cannot deliver value but can participate in creation and offering of value propositions" (Vargo and Lusch 2016, p. 8). This discrepancy resonates with Wilden *et al.*'s (2017) discussion on how to structure value networks and resource configurations to enable service innovation (Karpen *et al.*, 2015).

Another development in CSE research can be observed in the physical dimension in T2, which is conceptualized under the emerging theme *online* in the servicescape (Figure 1.3, circle B). In fact, scholars recently called for broader perspectives on the servicescape that capture activities of the customer at different physical places and moments in time (Heinonen *et al.*, 2010), e.g. investigating CSE in an online environment in comparison to retail store environments (Moody *et al.*, 2014; Trevinal and Stenger, 2014). Li *et al.* (2018) suggest taking an actors' perspective enabling a broader view on CSE at various points in time and also places, such as virtual or online environments (Moody *et al.*, 2014). This technology driven shift towards omni-channel usage (Grewal *et al.*, 2017) necessitates more

research attention that enables a better understanding of CSE and its dimensions in this rapidly emerging and complex context (Spence *et al.*, 2014; Trevinal and Stenger, 2014). The analysis further reveals that in T2 the social dimension receives more attention and plays a key role in the interaction linking the servicescape with the individual consumer. The emotional dimension is no longer considered in the servicescape, but receives research attention with regards to outcome measures of CSE in T2. Most importantly however, the sensory and cognitive dimensions seem rather disregarded in CSE research. The concept sense emerges under the theme *consumer* in close proximity to interaction and online, indicating that senses might play an important role in the *servicescape* and ultimately providing *outcome measures* for customers. We cannot find evidence for the cognitive dimension in T1 and T2. This finding can either be interpreted in such a way that the dimension has been captured through other less prominent concepts in CSE, or that there seems to be a lack of research that captures cognition in CSE research.

Since the focus of this study is on the sensory dimension of CSE, the analysis of sensory dominant studies reveals further insights (Figure 1.4). The articles in the sample show a strong product focus, with all five human senses closer connected to the theme *product* as opposed to *experience* or the limitedly represented concept service. Although scholars have stressed the importance of multisensory perception in CSE (Brakus *et al.*, 2009; Scott and Uncles, 2018), only two of five human senses (e.g. taste and smell; hearing and vision; touch and smell) show a connection and suggest a conjoint investigation. Interestingly, the findings reveal that senses are most dominantly investigated with products and not services. The analysis discloses that next to shaping product and brand perceptions; senses play a key role for consumption. In fact, Agapito *et al.* (2014) put forward that studies have stressed the importance of the sensory dimension in CSE as opposed to the other four dimensions, in that they are key to interaction and co-creation of value (Prahalad and Ramaswamy, 2004). Surprisingly, interaction is not found as a concept in sensory CSE research and likewise, only an indication of the importance of senses emerges from the findings in T2. Comparing insights from T2 and the sensory CSE research suggests that senses could play an important role at the intersection of the *servicescape* and sense-making process of the customer (Lipkin, 2016), which is classified in T2 as *outcome measures*. Indeed, a wide range of studies has revealed the importance of senses with regards to forming knowledge and an understanding of environment (Agapito *et al.*, 2014;

Krishna, 2012), yet it seems that CSE research is relatively underrepresented on its sensory dimension.

In sum, based on the analysis it becomes salient that academics have largely broadened the perspective on what constitutes CSE and shifted from a dominant product and provider perspective towards an interaction and value perspective (Vargo and Lusch, 2016; Lusch *et al.*, 2016). Although three (i.e. physical, social and affective) of the five CSE dimensions received more attention in T2, especially the cognitive and sensory dimension fall short in service literature. Our analysis reveals that senses play an important role in generating knowledge about products and brands (Figure 1.4), which suggests that the cognitive and sensory dimension are closely connected and relevant for customers to form their perceptions. The sensory focused analysis highlights several important insights that could benefit the services context. Combining these insights, the following sections highlight research gaps and develops important research questions, which should serve as direction for advancing CSE and service research

Avenues for future research

Although the five dimensions of CSE have been identified almost ten years ago (Brakus *et al.*, 2009), the results of this study clearly show that CSE research has paid limited attention to all its underlying dimensions and their impact on the service system, where in particular the sensory and cognitive dimension lack research attention. Accordingly, this sections presents five future research avenues along with potential research questions (see Table 1.1) that should guide future service, and in particular, CSE researchers.

Develop a more comprehensive understanding of the five dimensions of CSE

The social, physical, and to a limited extent the sensory dimension show a close connection to the themes interaction and the online environment (Figure 1.3), highlighting the importance for the servicescape. The affective dimension appears across all three analyses closely connected to CSE outcome measures. A recent study by Bustamante and Rubio (2017) define the customer's internal responses to the environmental stimuli as cognitive, affective and physical, whereas, the social dimension appears as an external response towards other actors within the servicescape. While

this study advances earlier models that aimed to capture CSE (Klaus and Maklan, 2012), two major limitations elicit that in line with findings in the present study call for future research. First, the authors measure the responses to service stimuli (through cognitive, affective and physical inner responses), however neglect the sensory dimension, which by its definition relates to sensory stimuli in the service environment. Second, the measurement of CSE emerges as a second-order construct where the individual dimensions in combination measure CSE. However, the findings of this paper suggest that the cause and effect may be much more fertile in that the social, physical and sensorial dimension indicate to play a potentially even subconscious role in the servicescape, while the affective and cognitive dimension most prominently occur with measurable outcome concepts. Accordingly, service research necessities investigations that look beyond existing methods, potentially draw on other fields (such as anthropology) to advance the understanding of CSE and its underlying dimensions.

Form insights into innovating CSE in service systems

The goal of service system innovation is to create value through configurations of technologies, people and other resources (Teixeira *et al.*, 2016). Effectively leveraging all three components enables value co-creation (Skålén *et al.*, 2015). Recent studies investigate service innovation from a value-in-use perspective (Yu and Sangiorgi, 2017), because research shows that successful service innovations require identifying and understanding CSE (Andreassen *et al.*, 2016). Service blueprinting, first introduced by Shoshack (1984), orchestrates front- and backstage processes from a customer perspective. This detailed view helps understand service encounters (Bitner 1992). Unlike customer product experiences, CSE take place when actors sense and acquire knowledge by interacting with contextual cues (Zomerdijk and Voss, 2010). Thus, the research focus should shift towards a more customer-centric perspective (Jaakkola *et al.*, 2015) or even balanced-centricity perspective (Verleye *et al.*, 2017). The aim of future research should be to provide guidance for successful service system innovations that reinforce multisensory rich value propositions.

Research direction	Research questions	Selected references
CSE	Which of the five dimensions of CSE (i.e. physical, social, affective, cognitive and sensorial) is most relevant in the service setting?	De Keyser <i>et al.</i> (2015); Lemon and Verhoef (2016); Roy (2018); Scott and Uncles (2018)
	What is the relationship between the CSE dimensions (e.g., hierarchical, or sequential)?	
	How can sensory stimuli and perception be integrated in omnichannel marketing?	
	What innovative research methods can be used to investigate multisensory CSE (e.g. sensory ethnography; sensory anthropology)?	
Service system architecture	How can service providers leverage CSE's dimensions when reconfiguring service processes?	Agapito <i>et al.</i> (2014); Bolton <i>et al.</i> (2018); Patrício <i>et al.</i> (2011)
	Which dimensions of CSE are most relevant for innovating service systems?	
	How can service providers design and manage multisensory rich value propositions?	
Servicescape	What role do senses play in different servicescapes (e.g. online vs. offline, transformative services)?	Nenonen <i>et al.</i> (2018); Rosenbaum and Massiah <i>et al.</i> (2011); Karpen <i>et al.</i> (2015)
	Which sequence or simultaneity of sensory perceptions fosters engagement in the servicescape?	
	How are CES's dimensions shaping the interaction between actors in the servicescape?	
	To what extent are sensory stimuli controllable in the servicescape?	

Table 1.1 Avenues for future research

Outcome measures	<p>How are sensory stimuli transformed into customer experiences?</p> <p>What is the role of prior experiences and /or expectations on sensory perceptions in the service encounter?</p>	<p>Agapito <i>et al.</i> (2013;2014), Bolton <i>et al.</i> (2018); Scott and Uncles (2018); Streiche and Estes (2016)</p>
Link disconnected research topics	<p>What are theories and insights about senses from other fields that are relevant for CSE?</p> <p>What role do different senses play in a MarTech context?</p> <p>What is the role of senses for different target groups in transformative services (e.g. disabled, or children vs. elderly)?</p> <p>Can a lack of senses (e.g. person with impairment or CSE context with sense restriction) be compensated by other senses?</p>	<p>Anderson and Ostrom (2015); Beudaert <i>et al.</i> (2017); Cheung and McColl-Kennedy (2015) Rosenbaum <i>et al.</i> (2011); Streicher and Estes (2016)</p>

Table 1.1 Avenues for future research (continued)

Investigate the effects of sensory stimuli in servicescapes

Despite the importance of CSE to service research (Ostrom *et al.*, 2015; Yu and Sangiorgi, 2017), existing studies have not established explicitly how customers derive experiences from value-creation processes (Åkesson *et al.*, 2014). While Rosenbaum and Massiah (2011) emphasize that the servicescape constitutes of a variety of stimuli that determine customer perceptions and reactions, we know little about how sensory processing of the multiple stimuli might translate into desired CSE. Along these lines Agapito *et al.* (2014) stress the urge for research that shows how customers use sensory stimuli resulting from the environment to derive knowledge and understanding.

Develop a more comprehensive CSE measure

A further lack of understanding exists regarding the influence of sensory perceptions on CSE (Yanagisawa and Takatsuji, 2015). This emerging research field requires a stronger foundation for understanding how conscious and subconscious stimuli might influence CSE (Bolton *et al.*, 2014). Studies focused on specific performance indicators as proxies for CSE cannot capture the subtle drivers of value creation (Åkesson *et al.*, 2014) or detail the overall experience (Berry *et al.*, 2002). In addition, a common assumption is that customers can articulate the underlying drivers of their experience, which contradicts the finding of Helkkula and Kelleher (2012) who show that each experience is temporal and momentary. The interplay of sensory information prompts customers to form perceptions continuously, throughout the service encounter (Ghanzanfar and Schroeder, 2006), such that assessing a customer experience after the service encounter may result in appraisals that do not reflect the actual CSE at the time customers experienced it (Kristensson *et al.*, 2015).

Reaching out to research areas outside the traditional focus of service research

The emerging stream on transformative service research (TSR) has encouraged scholars to take different perspectives (Rosenbaum *et al.*, 2011). Amongst others, two foundational pieces on transformative service research (e.g. Anderson and Ostrom, 2015; Cheung and McColl-Kennedy, 2015) have managed to shift well-being closer to the service researchers' attention. Although customer-centricity and designing for excellent CSE are central research and management topics, this focus omits specific target groups (e.g. people with sensory impairment) (Beudaert *et al.*, 2017). Future research should investigate how, for example, the absence of one sense can be compensated through the remaining senses. These studies are particularly important to avoid servicescape exclusion (Beudaert *et al.*, 2017). Furthermore, the shift towards omni-channel and MarTech context (Moody *et al.*, 2014) demands studies that explore the role of CSE's dimensions in technology driven online environments.

Managerial implications

This article analyses the scholarly body of CSE literature, yet, it also holds implications for service managers. First, the findings show the trending themes within CSE, i.e., service system architecture, servicescape, and outcome measures and their underlying concepts. Service managers may acknowledge this as state-of-art CSE in order to reflect and seize opportunities for improving their services and organizations. An example of such reflection might be to what extent are the currently implemented experience measures including the shift from satisfaction and brand perceptions towards emotions and senses? Second, senses are instrumental for customers to capture service perception and to gain information and knowledge. Thus, zooming into the sensory dimension enables service managers to identify, understand, and design sensory stimuli to establish more value-creating and meaningful experiences. The relative scarcity of CSE literature capturing the sensory dimensions suggest to interested managers to seek guidance in the most recent CSE literature or even outside the service marketing field, for example in psychology, design, or cognitive science. Third, the societal transition from offline towards online services is also reflected in our findings and has strong impact on the multi-dimensional role of senses. An online servicescape might not transport all sensory stimuli and their perceptions (e.g., smell) which might in turn be an opportunity for developing better experiences in offline retail settings. At the same time, digital technologies can be advantageous for service providers as they offer enhanced possibilities to test, control, and manage sensory stimuli (Trevinal and Stenger, 2014) such as e.g. eye-tracking. Fourth, the findings of this study point managers towards a more active customer role in the service system, in order to co-design multisensory rich CSE. Service design as an emerging approach offers novel methods such as service blueprinting and sensory ethnography that can facilitate these processes.

Conclusion

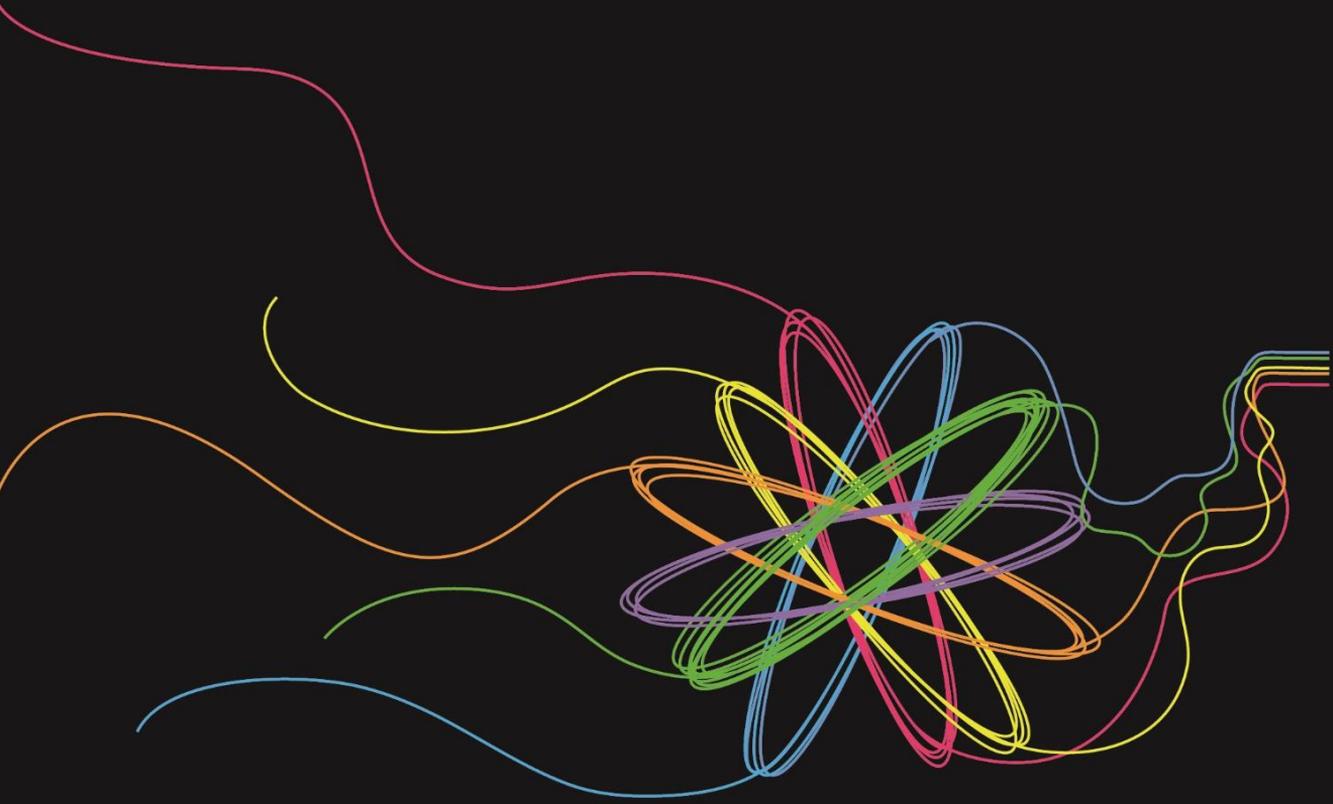
In summary the present study provides a comprehensive review of CSE literature across leading services and marketing journals over a course of 24 years. By means of a novel systematic, text mining approach, the paper not only presents the status quo in CSE research in the service domain, but also presents key avenues for future research that (a) create a more in-

depth understanding of CSE's underlying dimensions in complex service systems and (b) broadens the prospective towards emerging research topics such as transformative services.

Limitations

This article also features some limitations. First, the analysis of this study is based on a systematic literature review of a deliberately selected set of journals from the services and marketing discipline. The goal was not to provide an exhaustive list of publications, but rather provide a comprehensive overview on CSE research in services and marketing research. While this paper takes a service research focus, we acknowledge that other disciplines (e.g., design, human-computer interactions, psychology, social- and cognitive science) could contribute additional insights. Furthermore, the sample of CSE articles is bound to keyword selection. In addition, the inclusion criteria required an article to be published and in press, and therefore excludes working or unpublished papers.

Manuscript 2



Towards Multisensory Customer Service Experiences: A Cross-Disciplinary Bibliometric Review and Future Directions

Susan Stead, Ruud Wetzels, Martin Wetzels, Gaby Odekerken-Schröder, and Dominik Mahr

Department of Marketing and Supply Chain Management, School of Business and Economics, Maastricht University, The Netherlands



Under review in the Journal of Service Research

Stead, S., Wetzels, R.W.H., Wetzels, M.G.M, Odekerken-Schröder, G., and Mahr, D. (2020), "Towards multisensory customer service experiences: a cross-disciplinary bibliometric review and future directions", *Journal of Service Research*.

Introduction

Bricks and mortar will truly not fuse into brick and click until we understand how human senses work and how we improve multisensory engagement in any brand.

—Ari Peralta (Arigami 2018)

Both academics (e.g., Krishna *et al.*, 2017) and practitioners (e.g., Forbes, 2018) have proclaimed that customer experiences are service providers' new battlefield. Service providers increasingly are investing in marketing tactics that stimulate customers' senses (i.e., vision, touch, smell, sound, taste) and trigger their memories of past experiences, to help them form associations that guide their responses (Yoganathan, *et al.*, 2019). However, extant literature lacks a comprehensive, theoretical understanding of the sensory dimension (Mahr *et al.*, 2019). This lack of understanding not only impedes theoretical advancement but also undermines practical implementations of meaningful multisensory stimulation. Accordingly, we argue that the full potential of the customer experience can be realized only by understanding the sensory dimension.

Service and marketing researchers have investigated the effects of the visual, tactile, olfactory, auditory, and gustatory properties of products on customer evaluations and behaviors (Biswas *et al.*, 2014; Yoganathan, *et al.*, 2019). Existing research has studied stimuli in service environments (i.e., servicescapes), including the atmospherics of offline stores (e.g., Mattila and Wirtz, 2001; Spence *et al.*, 2014) and webmospherics in e-tailing (e.g., Kahn 2017; Petit, Velasco, and Spence 2019). Although these studies provide important insights into the relationship between servicescape atmospherics and customer perceptions and behaviors, they tend to examine the effects of individual senses (Helmfalk and Hultén, 2017) or combinations of just a few senses, such as music, scent, and color (Roschk, *et al.*, 2017). Thus, though they acknowledge the potential of multisensory customer experiences, they pay little attention to the simultaneous activation and interplay of all five senses (Scott and Uncles, 2018).

In this regard, it is difficult to draw on extant literature beyond the conventional boundaries of service research, because sensory research is a diverse, fragmented body of literature (Zhu and Mehta, 2017), scattered across disciplines. A comprehensive, interdisciplinary overview of this fragmented body of work is needed to reconcile all findings relevant to

multisensory experiences. Such insights would offer structure and guidance to service scholars who seek to understand the interplay of all five senses and their influences on multisensory customer experiences. After all, customers rely on their senses to form their perceptions and adapt their behaviors, particularly in new servicescapes (Wang *et al.*, 2012).

Accordingly, we undertake a systematic exploration of existing literature, both within and beyond the service domain, to advance the customer experience research field. By portraying and combining relevant insights from diverse research domains, this study makes two important contributions. First, it uses an objective, systematic approach to describe the status quo of sensory research within and beyond the service and marketing disciplines and to provide structure to a diverse, fragmented literature stream. With a combination of co-citation and text mining methods that originate in bibliometric research (e.g. Randhawa *et al.*, 2016), we address an interdisciplinary setting to uncover research gaps and develop an integral domain. This mixed-method approach helps overcome the biases of traditional literature reviews (Podsakoff *et al.*, 2005). Rather than relying on personal recollection and conjecture, the co-citation component focuses on data in the form of scholarly articles to systematically assess the origins, current status, and evolution of extant literature (Wilden *et al.*, 2017), and the text mining component removes human bias from the “within-text” dictionary development, text coding, concept correlation, and concept mapping (Liesch *et al.*, 2011).

Second, by using a mixed-method approach to generate cross-disciplinary insights, we establish an agenda for future research into how theories and concepts that stem from service, marketing, and other relevant disciplines (e.g., neuroscience, cognitive science, psychology) can be integrated to advance service research on multisensory customer experiences. By linking theories and methodologies from psychology and neuroscience, this study provides an interdisciplinary foundation for formulating a future research agenda that addresses relevant, established themes. This agenda highlights the need to investigate multisensory customer experiences systematically and in a multidisciplinary way, to integrate current knowledge on this complex phenomenon.

Theoretical background

Senses in servicescapes

Although the relatively young, emerging service discipline recognizes the sensory dimension as integral to customer service experiences, it includes only a few studies that unravel the role of senses in shaping these experiences (Mahr *et al.*, 2019). In relation to the sensory dimension, service research focuses mainly on the influence of stimuli on customer responses and behavior (Pareigis *et al.*, 2012). Such stimuli are elementary parts of the servicescape, defined as the combination of service deliveries and constructed physical environments that shape customer experiences (Bitner, 1992). In servicescape literature, scholars identify three dimensions that constitute stimuli—ambient conditions, spatial layout, and functionality—related to service-specific features and signs, symbols, and artifacts that pertain to style and decor (Mari and Poggesi, 2013). These dimensions are part of the materially staged servicescape (Chronis, 2019), encompassing all elements that service providers place in physical environments to influence customer behavior, as well as the communicatively staged servicescape, or verbal communications among actors and their influence on customer behavior (Pareigis *et al.*, 2012). Although extant service literature describes how material and communicative staging can be strategically implemented and managed (Chronis, 2019), the actual connections between both induced and uncontrolled stimuli and their connections to customers' five senses remain largely unexplored (Scott and Uncles, 2018).

Senses in marketing literature

A traditional research area in marketing explores the role of the senses in diverse ways (Krishna, 2012). In the earliest sensory research, Aristotle proposed the theory of aesthesis, suggesting a hierarchical ordering of senses, with touch at the top, enhanced by all other senses (Krishna, 2012). More recent studies indicate that humans switch between sensory modalities almost simultaneously (Yanagisawa and Takatsuji, 2017) and that this cross-modal interaction allows people to translate multisensory rich stimuli into perception (Driver and Spence, 2000; Yoganathan *et al.*, 2019).

The concept of sensory marketing also has generated a well-established literature stream; it defines sensory marketing as the use of triggers to stimulate customers' senses and affect their perceptions, evaluations, and behaviors (Krishna, 2012). Studies that focus on sensory marketing investigate how stimulation of the senses enhances customer engagement with products or services and facilitates storing of associations in customers' memories (Petit *et al.*, 2019). Early work by Hirschman and Holbrook (1982) established that customer experiences form during the interaction of services or products with customers' inner realms; such interactions involve switching between various sensory modalities, such as vision, taste, sound, scent, and tactile impression. Recent work on the role of external triggers and internal processing is more explicit; for example, Krishna (2012) highlights the difference between stimuli and sensory perception, in which the former appears in the form of visual, auditory, olfactory, taste, or tactile cues, and the latter encompasses awareness and understanding of the sensory information received. Although several studies investigate the effects of single or isolated stimuli on customer behavior (Grewal *et al.*, 2014; Roschk *et al.*, 2017; Spence *et al.*, 2014), scholars increasingly highlight the importance of understanding stimulations that activate multiple senses simultaneously (Helmfalk and Berndt 2018; Mahr *et al.*, 2019). This new focus suggests that senses cannot be understood in isolation but must be investigated in combination (Helmfalk and Berndt, 2018; Spence *et al.*, 2014).

The concept of consumption imagery relates to an understanding of senses in combination; it has been defined as the process in which customers retrieve sensory information from their memories (MacInnes and Price, 1987). Recently, scholars have demonstrated the multisensory nature of imagery experiences, finding evidence for a link between imagery and multiple sensory modalities (Biswas *et al.*, 2014). Aydinoglu and Krishna (2019) suggest that the activation of multiple senses can lead to more meaningful, personalized associations with existing experiences. Thus, though the focus of empirical research is shifting from single to multiple stimuli, it is essential to continue to broaden perspectives on this phenomenon and learn from other disciplines. To this end, we systematically explore extant sensory literature, across disciplines, to set a research agenda and obtain a comprehensive understanding of the simultaneous activation and interplay of all five senses in the multisensory customer experience.

Methodology

Our study combines text mining and co-citation methods with the aim of expanding the conceptual and theoretical understanding of multisensory experiences (see Figure 2.1). This approach has two major advantages. First, it allows us to systematically and objectively review a substantial amount of heterogeneous literature that would be impossible for an individual researcher to read and interpret manually (Antons and Breidbach, 2018). Second, it reduces the researcher bias that can affect traditional literature reviews (Wilden *et al.*, 2017).

We conducted our analysis in three stages. In Stage 1, we employed text mining, which is a form of unstructured ontological discovery (Randhawa *et al.*, 2016) that identifies concepts and themes across a large body of literature. We used Leximancer 4.0, which applies a Bayesian learning algorithm, to review complex and interwoven phenomena, (i.e., contributions to sensory research) in a rigorous, systematic way (Biesenthal and Wilden, 2014). In Stage 2, we conducted a finer-grained analysis of sensory literature's roots, using co-citation analysis to explore the development of the research field and, in particular, how the concept of senses has been integrated into other literature streams. We carried out Stages 1 and 2 for two sets of articles: (1) literature in the service and marketing discipline and (2) publications in four relevant disciplines beyond the boundaries of service and marketing research. For the most deeply rooted publications in both publication sets, we identified the underlying research streams. In Stage 3, we overlaid the resulting visual maps to identify research gaps, identify important themes, and set a theoretically grounded research agenda. Figure 2.2 outlines the various methodological stages.

Sample selection

Because our first intention was to describe the status quo of multisensory research in service and marketing, we used Thompson Reuters' *InCite Citation Index* to identify the top peer-reviewed journals according to impact factor (IF). For our analysis, we included marketing journals with a five-year IF equal to or higher than 2 ($IF \geq 2$). In total, we considered 37 journals (see Figure 2.2). To select our keywords, we contacted experienced researchers in the field and, through discussion with them, selected the

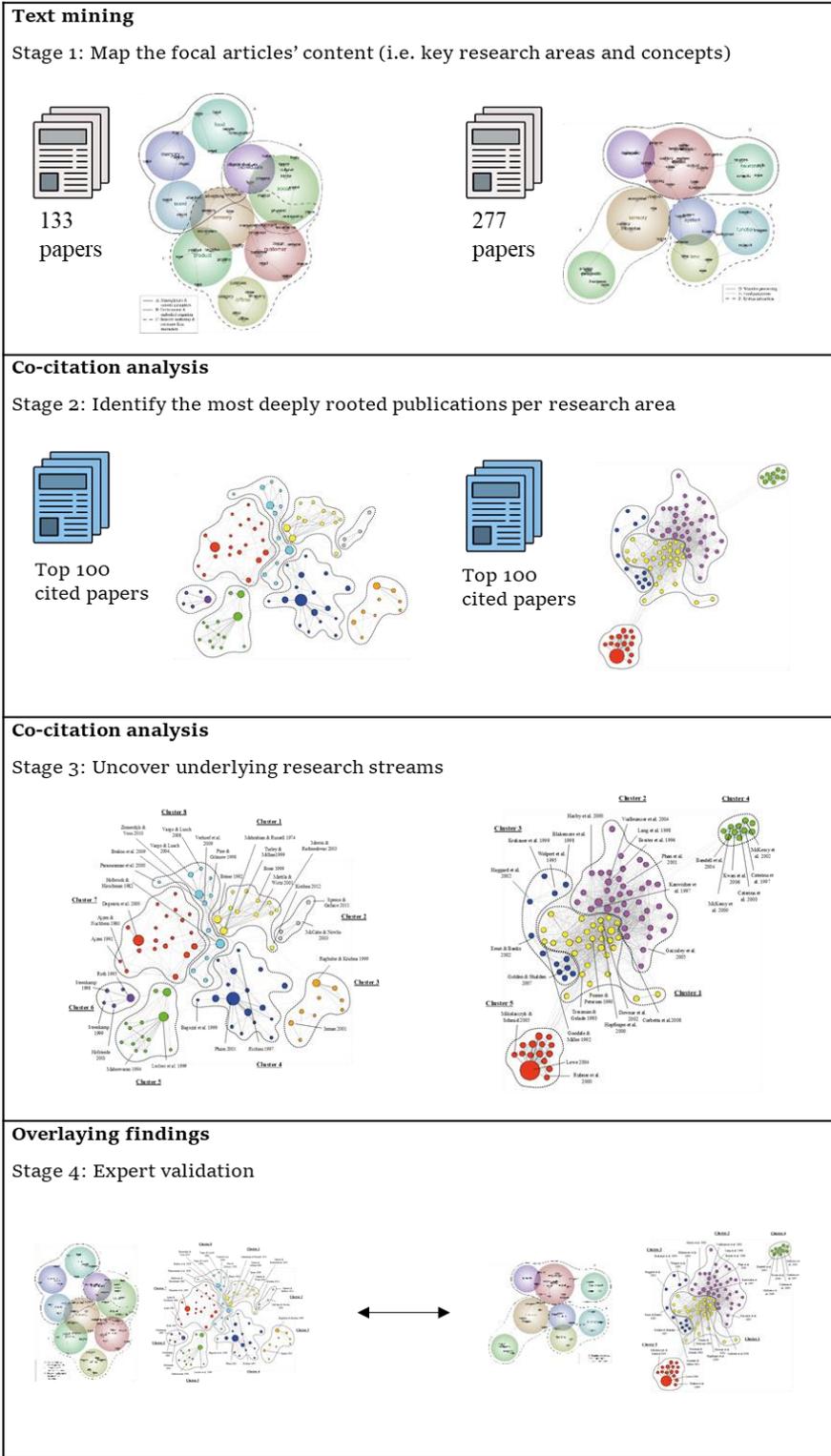


Figure 2.1 Overview of the mixed method approach

following list: “sensory,” “sensorial,” “multisensory,” “multi-sensory,” “sense,” and “senses.”

In the next step, we conducted an issue-by-issue search of the six keywords in *Web of Science* across title, abstract, or keyword sections of all 37 journals. We imposed this restriction to ensure that “senses” and “sensory perception” were the major focus of the articles. In addition, we established the following inclusion criteria for articles: (1) published in English; (2) contain at least one of the search words in the title, abstract, or keyword section; (3) published and available in any online archive or database; and (4) considered a full article (i.e., calls for papers, abstracts, or proceedings were not included).

Our search resulted in an initial set of 536 articles (see Figure 2.2). Next, two of the authors independently read and coded the articles to ensure that “senses” or “sensory stimuli” were the main subjects of investigation. They agree on 93% of the decisions; for the relatively few articles that prompted distinct decisions, we involved a third independent coder. The final sample, after excluding 402 articles from the original, consisted of 133 focal articles. The most common reason for excluding articles was that their abstracts included general phrasing, such as “in a sense that.”

Because sensory research receives significant scholarly attention beyond service and marketing, our second intention was to identify (1) the main disciplines that contribute to the topic, (2) the focal articles in these categories with their theoretical foundations, and (3) the themes and concepts that emerge from these disciplines. We used an iterative process to derive this set of articles.

In the first step, we used the same list of keywords and search criteria to generate an open search in *Web of Science*. According to the search results, we identified the top four research categories that investigate sensory phenomena: neuroscience, psychology, food science, and computer science. Because an enormous number of articles matched our search and inclusion criteria across all four disciplines (see Figure 2.1), we restricted the set of focal articles for the coding procedure to the top 1,000 articles as a proportion of the number of publications per discipline. That is, proportionally, of the top 1,000 journal articles, 51% were from neuroscience, 19% were from psychology, 17% were from food science, and 13% were from computer science (see Figure 2.1).

In the second step, we identified the top 20 journals per discipline according to a five-year impact factor. We followed this step with an actual issue-by-issue search of the top 20 journals per discipline. To identify the most influential papers for each discipline, we selected the most cited papers in each field: 521 from neuroscience, 188 from psychology, 168 from food science, and 133 from computer science. In sum, they constituted the sample of the top 1,000 focal articles. We followed the same procedure for coding that we followed for the marketing articles, resulting in a 96.5% overlap. After involving a third coder, we identified 277 cross-disciplinary articles as the focal sample for further analysis.

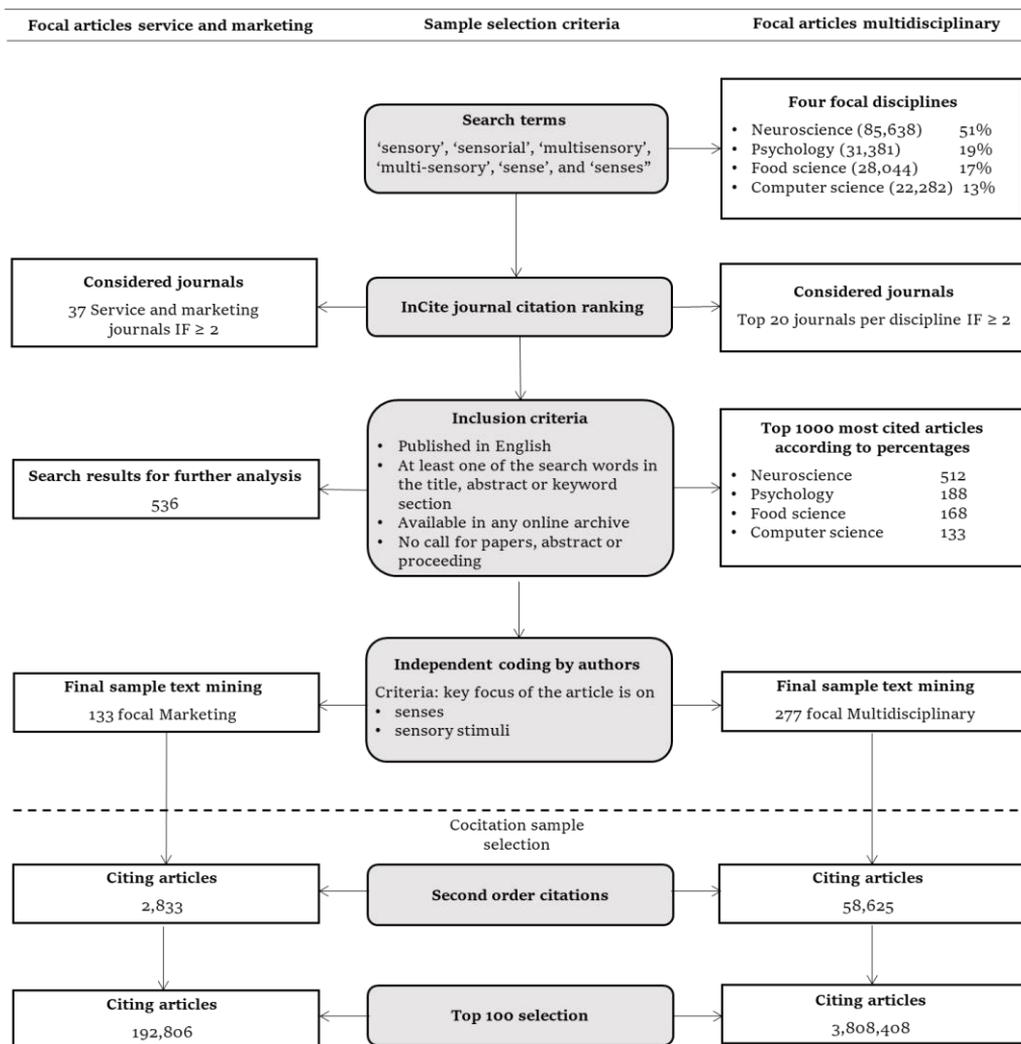


Figure 2.2 Data collection overview

In the third and final step of sample selection, we sought to generate a set of publications that represents a broader perspective on the theoretical foundations of sensory research. Co-citation analysis identifies relationships and communities among authors and their developed theories and concepts (Randhawa *et al.*, 2016). Our starting point for the co-citation sample selection was focal article sets, that is, the 133 marketing and 277 cross-disciplinary articles (see Figure 2.2, below the dotted line). Using *Web of Science*, we identified all citing articles of each set, resulting in 2,833 marketing papers and 58,625 cross-disciplinary papers. From this pool of articles, we identified all references, and therefore all citations in all articles, resulting in 192,806 marketing papers and 3,808,408 cross-disciplinary papers. Following common practice in bibliometric studies, we then identified the top publications, referred to as deeply rooted publications, according to degree range, edge weight, and number of citations (Wilden *et al.*, 2017).

Analysis

Text mining

In the first stage of analysis, our goal was to provide a more detailed understanding of the themes and concepts of sensory research that emerged from focal articles. That is, we were interested in the status quo of sensory research within the service and marketing discipline and from a cross-disciplinary perspective.

The conversion of the textual corpus of all publications into meaningful themes and concepts required several data preparation steps. After downloading the focal articles from online archives, we cleaned all articles by removing headers and footers, journal or publisher information, author names, year of publication, acknowledgements, and reference lists, to avoid causing meaningless or biased co-occurrences in the analysis (Mahr *et al.*, 2019). Leximancer analysis extracts vocabulary that carries semantically related meanings, in which the output constitutes visual and tabular representations of identified themes and concepts (Randhawa *et al.*, 2016). Words that co-occur frequently in a body of text appear as concepts, whereas concepts that appear frequently in a similar context are grouped under themes (Mathies and Burford, 2011). The relative size of the themes gives an indication of their importance to other themes and concepts. The

semantic relationship between concepts is indicated by their relative distance and closeness (Smith and Humphreys, 2006). Thus, strongly connected concepts appear in close proximity.

Although Leximancer follows an automated machine learning algorithm (Wilden *et al.*, 2017), an elementary part of text mining is the manual cleaning and grouping of seed words that later are clustered into concepts. Examples of general terms that we excluded from the analysis are seed words such as “research,” “study,” “method,” and “significant.” The reason for these exclusions is that these words, commonly used throughout articles, do not add particular meaning to the analysis. We also grouped singular and plural versions of seed words (e.g., product, products) into one concept.

Co-citation

The goal of the second stage of our analysis was to explore the intellectual structure of the field, that is, its theoretical roots. Specifically, we were interested in how the most important publications in the two focal sets are integrated with other research streams. We found that these most deeply rooted articles constituted 13 publications of the service and marketing focal set and 28 publications of the cross-disciplinary focal set (see Figures 2.4 and 2.6). To this end, we employed co-citation analysis, a method frequently used in bibliometric studies (Randhawa *et al.*, 2016). Co-citations refer to events in which two references are cited by a third article. The underlying idea is that the more frequently two publications are cited together, the more likely their content is related (Zupic and Čater, 2015). Thus, by mapping the most frequently cited publications along with the most important publications in our focal sets, we were able to reveal their integration with other research streams.

Our co-citation analysis required two steps. First, we used Bibexcel and Gephi software packages to create network diagrams based on the co-citations. In the resulting graphs, the distance between publications is reflected in the path length, and the connections between publications are based on the number of co-citations (Randhawa *et al.*, 2016). Second, we used the Lovain modularity optimization method (Blondel *et al.*, 2008) to identify clusters of closely connected publications. Clustering quality is assessed by the modularity parameter and considered acceptable when it exceeds 0.4 (Blondel *et al.*, 2008). For the service and marketing set, we

found a modularity parameter of 0.53. For the cross-disciplinary results, we found a modularity parameter of 0.58.

Results

To shed light on the conceptual structure of sensory research within and beyond service research, we integrated the findings of our text mining analysis with the related research streams that resulted from both co-citation analyses. In Figure 2.2, Stages 1 to 3 graphically depict our synthesized analysis. Text mining allowed us to identify the conceptual structure of sensory research, and co-citation analysis uncovered the theoretical roots of the most deeply rooted publications.

Status quo of sensory research in service and marketing literature

Figure 2.3 depicts the text mining results of the content of 133 focal service and marketing articles. Notably, several themes are closely linked, whereas others are distant. The two most dominant themes that form the center of connections are *customer* and *sensory*. Because sensory research mainly involves customers, it is not surprising that these themes emerge as the most pronounced and connected themes. Furthermore, the theme of *sensory* appears as the main connection to most other themes.

To dive deeper into the two most dominant themes, we analyzed semantically closely connected themes and concepts. This analysis allowed us to define three main research areas, as illustrated in Figure 2.3: (A) atmospherics and sensory perception, (B) service environment and social interaction, and (C) customer- and firm-related outcome measures. A more detailed examination of the most deeply rooted publications for each of the three research areas through co-citation analysis (Figure 2.4) uncovered their integration in other research streams.

Research area A: atmospherics and sensory perception

Text mining results in Stage 1 show that research on atmospherics and sensory perception focuses on the themes of *food*, *scent*, *memory*, and *sensory*. The key concepts these studies investigate are the atmospheric influences of vision, scent and sound. This finding confirms Roschk *et al.*, (2017) recent meta-analysis that identifies music, scent, and color as the three atmospherics that have received the most research attention over the

past 30 years. The results also show that all three atmospherics are connected to the theme of *memory*. Research in this area has investigated the effect of various scents, types of background music, and color on customers' memories (e.g., Herz and Engen, 1996; Shapiro and Spence, 2002). The themes of *scent* and *sensory* also are connected through the concept of attention; attention and scent are important drivers of brand name recognition and recall (Morrin and Rahneshwar, 2000). Cognitive theory research finds that customers' cognitive perceptions mediate their relationships with ambient scents and emotions (Chebat and Michon, 2003). It also focuses on atmospherics related to food consumption, in which the most dominant concepts are taste and smell. Moreover, it links taste to sound, showing that multiple senses have been investigated.

The co-citation analysis in Stage 2 reveals that Clusters 1 and 2 are strongly related to atmospheric and sensory perception research (see Figure 2.4). Research in Cluster 1 focuses on atmospherics that surround focal service or product offerings. In early developments of atmospheric research, Mehrabian and Russell, (1974) proposed that environmental stimuli are linked to customers' behavioral responses. The authors identified measures such as light, sound, heat, and color that drive emotional responses. Bitner (1992) built on these early approaches by establishing the servicescape as a framework to highlight the influence of the physical surrounding on customer-employee interactions, in which olfactory and auditory senses are most dominant units of analysis (e.g. Bone and Ellen, 1999; Mattila and Wirtz, 2001). Cluster 1 links closely to Cluster 2; for example, Krishna (2012) not only presents an integrative review of sensory marketing research but also highlights less examined areas that provide rich opportunities, including the finding that the sense of taste relies on all the other senses, and taste alone does not distinguish food items consumed (Krishna, 2012). Similarly, Bone and Ellen (1999) claims that retailers lack theories to predict olfaction effects reliably. Although the concept of touch does not appear as a theme or concept in our text mining analysis, it does emerge as an important concept in Cluster 2 of our co-citation analysis. Research in this cluster highlights the role of haptic information processing: McCabe and Nowlis (2003) reveal that customers prefer to touch products, especially those with material properties, such as clothing. Furthermore, they find that vision is highly diagnostic, such that when product properties are clearly described, the need for touch is reduced. Spence and Gallace (2011) argue that a single sense, such as touch, can steer all other senses and modulate customers' multisensory experiences. They

find that the hedonic attributes of products that are perceived by one modality (e.g., touch) can leverage or even bias people's evaluations of product qualities that they derive through other senses. That is, sensory alignment or cross-modal connections lead to overall multisensory experiences (Spence and Gallace, 2011).

Research area B: service environment and social interaction

Text mining in Stage 1 identifies a second research area that consists of themes related to the topic of service environments and social interactions. The three main themes in this research area are *social*, *customer*, and *individual*, and a partial theme is *sensory* (see Figure 2.3). These themes are described by key concepts, such as objects, space, environment, human, physical, culture, relationship, body, sense, design, brand, image and experience. In line with servicescape literature, we find that the interaction of customers and service environments is prominent. Our findings can be linked to theories of grounded cognition and embodied cognition, which suggest that customer actions are situated in bodily states and influenced by contextual stimulation from their environments (Borghini and Cimatti, 2010).

The co-citation analysis in Stage 2 also reveals that Clusters 1, 5, and 6 provide insights on the theoretical lenses of the articles (see Figure 2.4). Scholars identify social and cultural influences on experiences and relationships (Leclerc, Schmitt, and Dubé, 1994), as well as human sense-making processes involving body-related information (Rosa, Garbarino, and Maller, 2006) and physical surroundings (Bitner, 1992). Whereas Cluster 1 provides the theoretical grounds for understanding physical surroundings, Clusters 5 and 6 focus on theories related to cultural differences and the effects of foreign branding (Leclerc *et al.*, 1994). Examples of emerging literature streams from the co-citation analysis include Hofstede's (1980) cultural dimensions' theory, which provided the grounds for later research that identified the impact of foreign markets (Maheswaran 1994) on brand image, product performance, and customer innovativeness (Steenkamp *et al.*, 1999; Roth, 1995). Roth (1995) highlights that power distance, regional socioeconomics, and individualism influence brand image strategies at the functional, social, and sensory strategic marketing levels.

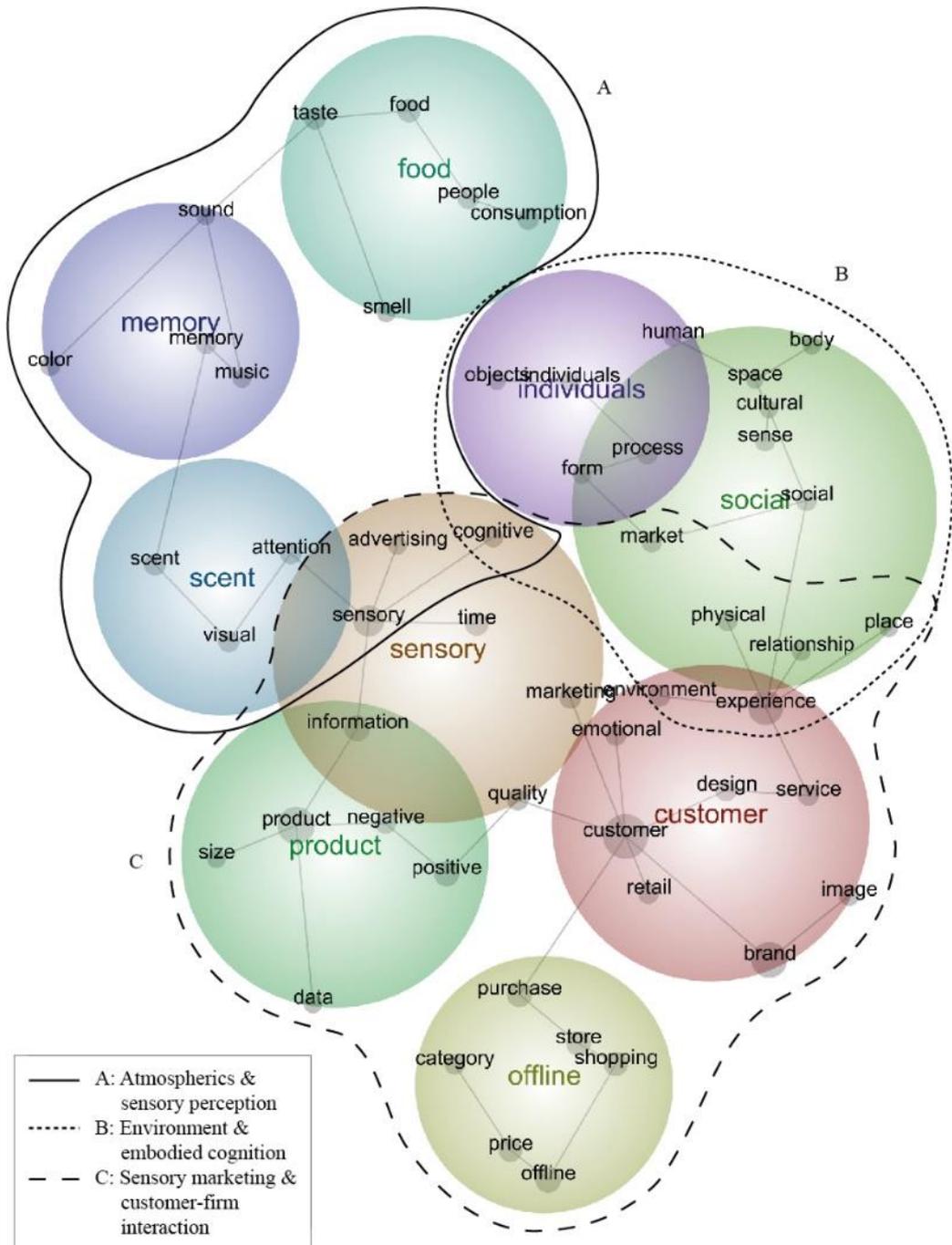


Figure 2.3 Concept map of focal publications within marketing

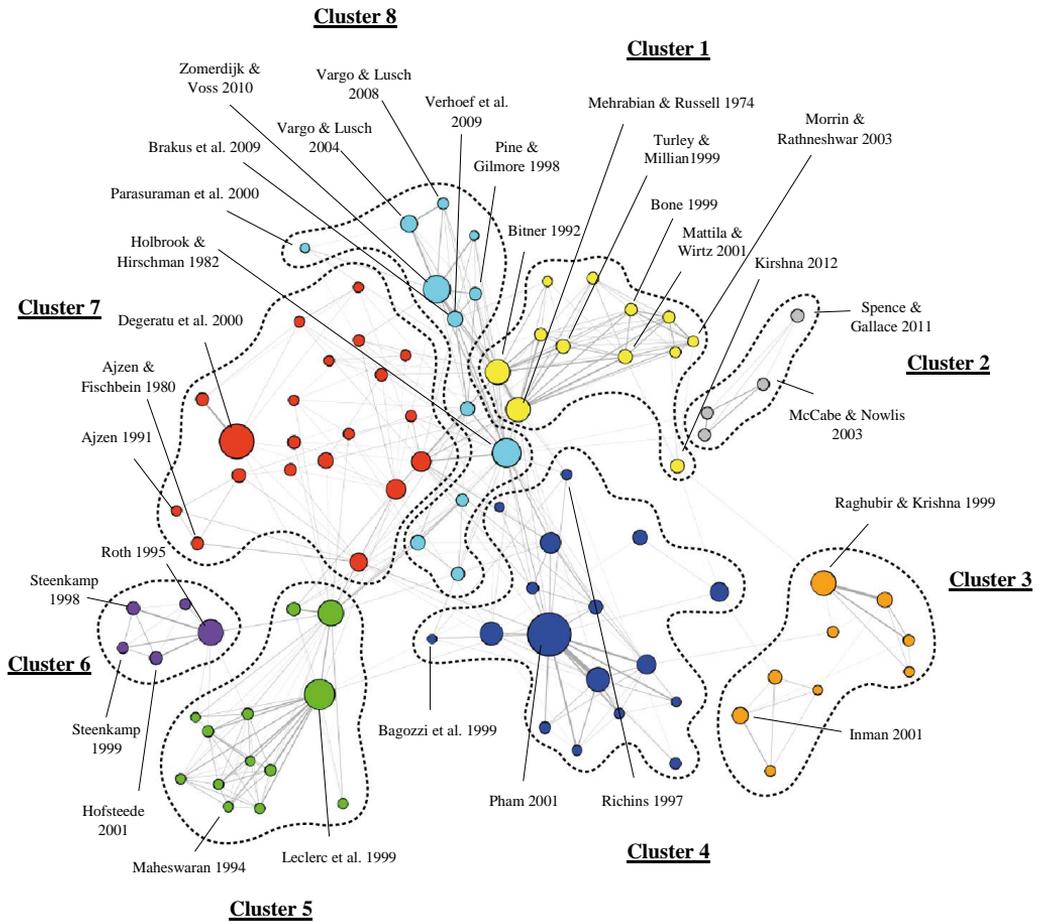


Figure 2.4 Co-citation map of the theoretical roots in marketing

Note: Node (circle) size is determined by number of citations, and edge (line) strength is determined by number of co-citations. To increase readability, only edges between articles with more than 11 co-citations, publications with a degree range >3, and selected publications are displayed.

Research area C: customer- and firm-related outcomes measures

Text mining in Stage 1 reveals a third research area that we classify as customer- and firm-related outcomes. The key themes in this research area are *customers*, *product*, and *offline*, with partial themes of *sensory* and *social*. The most dominant theme of *customer* consists of concepts such as brand, experience, retail, emotional, image design, and service. The concepts of marketing and quality link to the theme of *sensory*, under which information, advertising, time, and cognitive are the most investigated concepts. The *consumer* theme also links through quality to the theme of *product*, in which assessment and evaluation concepts such as information, negative, positive, data, and size appear. In line with research that adopts a service-dominant logic (Vargo and Lusch, 2004, 2008), the *consumer* theme closely ties to the *social* theme. In particular, attention is shifting to customer experiences in the service context (Mahr *et al.*, 2019); researchers are increasingly investigating customer–firm relationships through experiences and emotional measures of, for example, products and services (Bitner 1992; Rosenbaum and Massiah, 2011). The concepts of experience and emotions appear in close proximity to the theme of *sensory* and provide an important indicator of customer perceptions and intentions (Bagozzi *et al.*, 1999).

The theme of *offline* also emerges from the focal article set, indicating a strong research focus on traditional service experiences in brick-and-mortar stores rather than online services. The *offline* theme is connected to the theme of *customer* through the concept of purchase. The additional concepts of store, shopping, price, and category indicate research attention to customer shopping behavior (Chu *et al.*, 2010), the impact of category allocations (Breugelmans and Campo, 2016), and customer price sensitivity (Chu *et al.*, 2008).

Co-citation analysis in Stage 2 identifies four research streams that contribute to customer- and firm-related outcome measures. First, early work by Holbrook and Hirschman (1982) advances existing information processing models, directing attention to the symbolic, hedonic, and aesthetic nature of consumption (Cluster 8). Using this paradigm, scholars pay increasing attention to the dimensions of the consumption experience and measurable outcome variables such as perceived quality, satisfaction, and loyalty (Brakus *et al.*, 2009; Parasuraman *et al.*, 1985; Pine and Gillmore, 1998). With the emergence of the service-dominant logic in the

early 2000s (Vargo and Lusch, 2004; 2008), researchers associated with this cluster shifted their attention from products to services; services became prominent in the theme of *customer*. In particular, authors emphasized that organizations should design and manage experience-centric services (Verhoef *et al.*, 2009; Zomerdijk and Voss, 2010).

Second, researchers began to focus on the role of emotions according to customer states, suggesting that such states are important drivers of the customers' decision-making processes (Pham, 1998; Richins, 1997). Affect-confirmation and goal-directed behavior (Bagozzi *et al.*, 1999) were key topics for these studies (see Figure 2.4, Cluster 4).

Third, the co-citation analysis identifies a separate literature stream (Cluster 3) that relates to customer variety seeking and volume perception. This cluster largely is influenced by work by Raghurir and Krishna (1999), who focus on the role of vision and the perception of volume consumption. Scholars find that product choice is influenced by, for example, packaging and variety (Inman, 2001; Ratner *et al.*, 1999). The role of senses, perception, and experience also are common themes. Vision and touch are the two most represented senses in these studies; though the text mining analysis reveals links between sensory and vision, it does not reference the concept of touch.

Fourth, some theoretical advances emerge from the co-citation analysis for Research Area C (Clusters 7 and 8). Ajzen (1991) has provided a significantly better understanding of customer behavior and perception through his work on the theory of reasoned action (Ajzen and Fishbein, 1980) and the theory of planned behavior (Ajzen, 1991). Moreover, it shows that the influential work of Degerat *et al.* (2000) on consumer choice behavior constitutes a defusing stream; those authors show that brand names are more valuable in online contexts that have fewer attributes and less information than other contexts. In such contexts, customers are more price sensitive and more likely to value factual (non-sensory) information. These results further highlight the emerging research interest in online retailing contexts; surprisingly, the text mining analysis of focal articles does not reveal this interest.

In summary, an aggregated view across all three research areas reveals that sensory research in service and marketing literature focuses on the design of atmospherics, sensory perception (Research Area A), service environments, social interaction (Research Area B), and customer- and firm-related outcomes (Research Area C). Surprisingly, it seems to neglect

the role of senses and stimuli processing. Although the *sensory* theme is connected to scent through attention, there is no direct connection to sound, taste, or smell. Although focal articles in the co-citation network highlight the importance of understanding the connection and processing of multiple stimuli across all modalities (Krishna, 2012; Spence and Gallace, 2011), consumers' inner realms (Lipkin, 2016) remain a "black box" of service and marketing research. Furthermore, with the exception of significant research on atmospherics and some research focus on evaluation concepts such as attention and cognition, we do not find any concepts that help us understand the conceptual structure of multisensory perception. Therefore, in a next step, we sought a more holistic perspective, by mapping the content of cross-disciplinary articles and the co-citation network of the most influential articles.

Cross-disciplinary perspective on sensory research

By broadening the scope and taking a cross-disciplinary perspective on multisensory research, we offer important insights from extant literature that go beyond the traditional boundaries of service research. Figure 2.5 depicts the text mining analysis of the content of 277 cross-disciplinary focal articles. We identify three research areas that—similar to service and marketing focal articles—are connected by the theme of *sensory*: stimulus processing (Research Area D), food perception (Research Area E), and system interaction (Research Area F). Next, through the co-citation analysis, we focus on the most deeply rooted publications per research area to uncover their integration with other research streams, as highlighted by the clusters in Figure 2.6.

Research area D: stimulus processing

Text mining of the cross-disciplinary literature pool (Stage 1) identifies the first research area as stimulus processing. Research in this area is described by the themes of *cortex*, *neurons*, and *episodic*. The themes of *cortex* and *episodic* are closely connected through the concept of *stimulus*. Important concepts that constitute the *cortex* theme are functional, brain, activity, visual, auditory, and motor, whereas the theme of *neurons* consists mainly of the concepts of synaptic and cells. These themes reflect research on the principal systems of the human brain, that is, the sensory, motor, and attention systems (Posner and Petersen, 1990).

The co-citation analysis in Stage 2 reveals that the most deeply rooted publications in Research Area 4 stem from cognitive psychology and neuroscience. They revolve around the interplay of three systems: sensory, attention, and motor (see Clusters 1, 2, and 3 in Figure 2.6, respectively). The neural-systems area contains publications that focus on multisensory integration and stimulus-driven visual attention. Angelaki and Gu (2010) suggest that the brain seamlessly integrates sensory information from different sensory modalities into a unified perception. That is, formation of perception in the neural system entails incorporating input from all sensorial modalities, especially in neuroscience, in which research focuses on multisensory integration. For example, Ernst and Banks (2002) posit that when a person visually and tactilely explores an object, vision and touch both provide information about the object; the nervous system combines visual and haptic information, such that visual dominance occurs when visual processing connects more easily than haptic processing to existing memories. Downar *et al.* (2000) show that changes in visual, auditory, and tactile stimuli activate different regions of the brain, suggesting that simultaneous multisensory stimuli integration occurs.

The role of attention in multisensory integration also has received significant research attention. Gazzaniga *et al.* (2011) investigate whether stimulus-driven visual attention—that is, focusing on one source of visual sensory inputs at the expense of others—operates at early, perceptual stages or at late, post-perceptual stages. They find that attention can operate at both stages, depending on the nature of the stimuli and task. For example, according to the feature-integration theory of attention (Treisman and Gelade, 1980), recognition of a novel object requires information integration across multiple modalities until the full object can be identified (Treisman and Gelade, 1980).

From an empirical perspective, Hopfinger *et al.* (2000) show that functional magnetic resonance imaging (fMRI) can be used to study selective visual attention through the interplay of attentional control systems and sensory brain structures. The superior frontal, inferior parietal, and superior temporal cortexes (i.e., specific regions in the temporal cortex, the part of the brain that is associated with processing sensory input) are selectively activated by stimuli, indicating that these structures belong to a network for selective attentional control. Corbetta *et al.* (2008) extend this knowledge by unraveling the role of adaptive behavior—that is, the reorientation between two environmental stimuli—as part of a neuroanatomical model of attention. They show that attention

consists of dorsal and ventral attention networks. The dorsal network involves goal-directed attention processes, such that the network enables the selection of stimuli according to current goals or expectations and preexisting information about presented stimuli (Corbetta *et al.*, 2008). Rather than selectively assigning attention and behavior toward stimuli, the ventral network reorients attention toward unexpected or unfamiliar stimuli (Posner and Peterson, 1990).

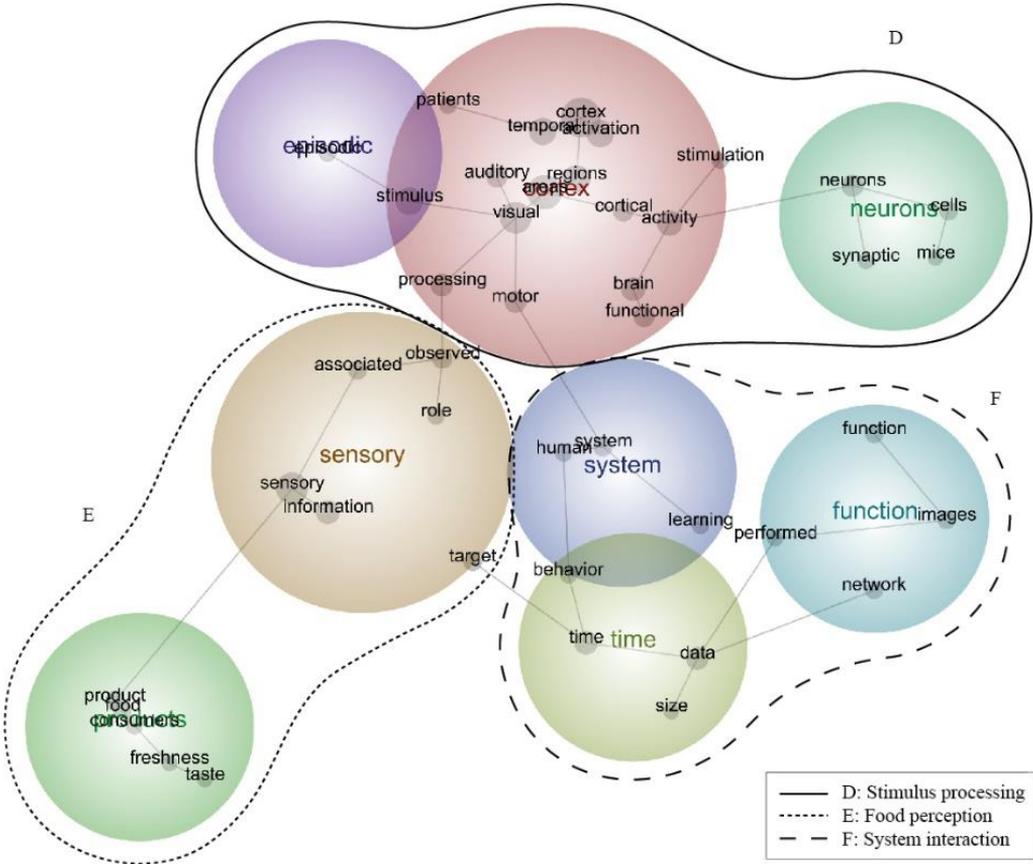


Figure 2.5 Concept map of focal publications beyond marketing

Then the stimulus processing area (Figure 2.5, Area D) contains research that focuses on emotional processing. For example, Lang *et al.* (1998) propose a theoretical model of emotion in which humans process visual stimuli that trigger emotional arousal, and an underlying motivational structure (appetitive versus aversive) elicits visceral and behavioral responses. Several foundational studies in this research area investigate the role of habituation and emotions with regard to facial perceptions. By means of fMRI, Breiter *et al.* (1996) study emotional processing (i.e., amygdala activity) whereby participants are exposed to visual stimuli in the form of presentations of fearful, happy, and neutral faces. They find that participants rapidly habituate to emotionally valenced (fearful or happy, as opposed to neutral) faces. Furthermore, Kanwisher *et al.* (1997) use fMRI to identify a brain region associated with recognition (i.e., fusiform gyrus). Attention is considerably more prominent when participants are confronted with faces rather than common objects. Another foundational research avenue relates to the mind-body connection; Damasio *et al.* (1996) propose somatic marker theory, which relates to feelings in the body that associate with emotions and drive decision making. For example, a rapid heartbeat associated with anxiety consciously or subconsciously influences responses to environmental stimuli.

The stimulus processing research area contains publications that focus on sensorimotor integration. For example, Wolpert *et al.* (1995) find direct support for a central nervous system that simulates the behavior of the motor system in tasks such as planning, control, and learning. Similarly, Shadlen and Newsome (2001) study the interplay of the sensory and motor systems. They find that rather than following a separate decision process, decisions are embodied in direct transformations between the relevant sensory and motor systems. In relation to kinematics, Krakauer *et al.* (1999) suggest that in reaching for objects, neural processing transforms visuospatial information about the target location of an object into motor commands that specify muscle forces and joint motions that move the hand to the desired location. This mechanism is part of working memory systems (Krakauer *et al.*, 1999).

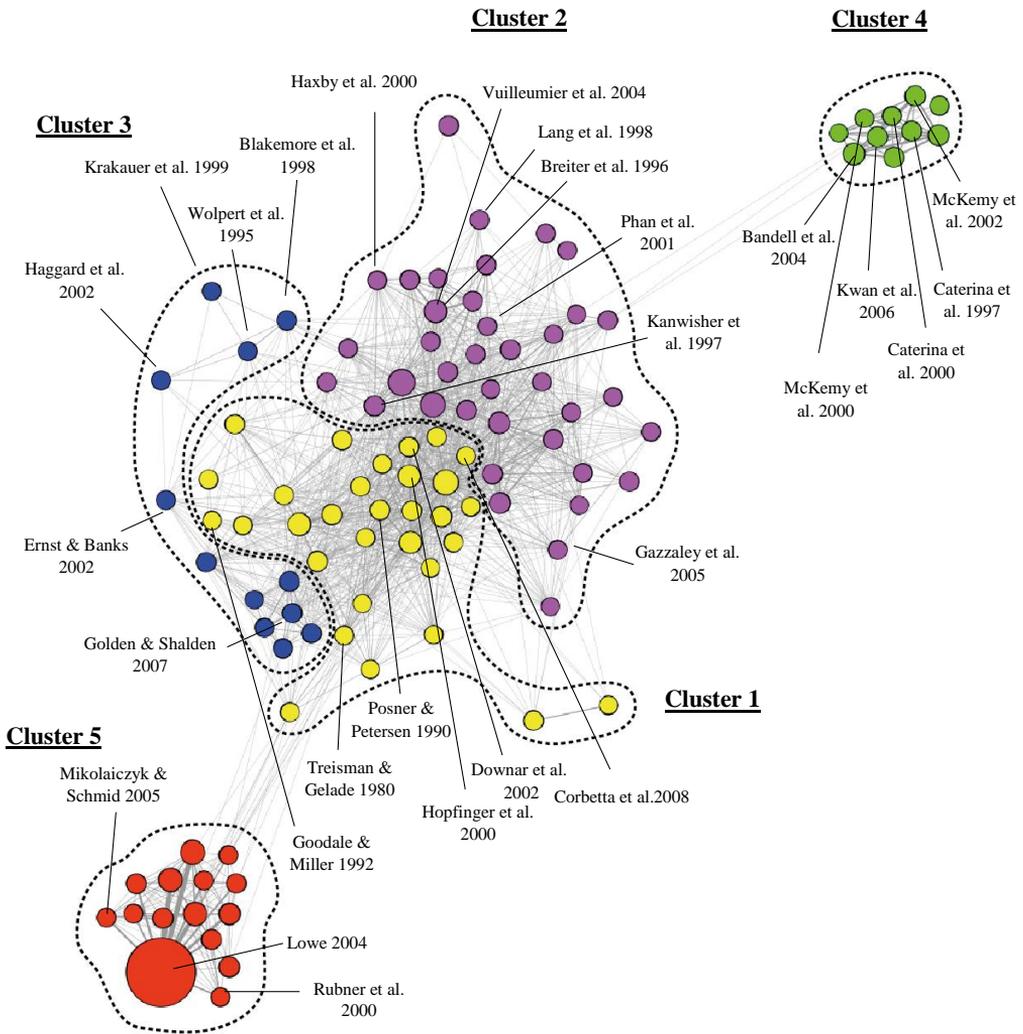


Figure 2.6 Co-citation map of the theoretical roots beyond marketing

Note: Node (circle) size is determined by the number of citations, and edge (line) strength is determined by number of co-citations. To increase readability, only edges between articles with more than 10 co-citations, publications with a degree range >3, and selected publications are displayed.

Research area E: food perception

Text mining in Stage 1 identifies the research area of food perception, described by the themes of *products* and *sensory*. Concepts related to *products* are food, taste, and consumers, whereas concepts related to *sensory* are information, associated, and observed. The co-citation analysis in Stage 2 reveals that the most deeply rooted publications in this research area relate to perceptions of extreme food items, as well as auditory and thermal stimuli perception. Bandell *et al.* (2004) find that the transient receptor potential (TRPA1) family of ion channels (i.e., gateway for ionized cells) is activated by the natural components of extreme foods (e.g., cinnamon oil, mustard oil, ginger).

These compounds elicit a painful sensation and offer a molecular model for why noxious cold can paradoxically be experienced as burning pain. Relatedly, Kwan *et al.* (2006) highlight a different role of TRPA1 in the inner ear: It facilitates sensing of sound, painful cold, and irritating chemicals. The publications are strongly integrated with the food science field (see Figure 2.6, Cluster 4).

Connected studies in this field revolve around the neural basis for thermosensation and the neural basis for extreme food perception. Caterina *et al.* (2000) identify the capsaicin (vanilloid) receptor VR1 as a cation channel connected by primary sensory neurons of the pain pathway. It fulfills an essential role for selective modalities of pain sensation and for tissue-injury-induced thermal hyperalgesia, which is a condition of heightened sensitivity to noxious heat or cold. In a closer look at thermal sensation, McKemy *et al.* (2002) focus on how humans sense cold (i.e., they understand cellular and molecular mechanisms). Together with the heat-sensitive channels VR1 and VRL-1, TRP channels detect temperatures and act as the principal sensors of thermal stimuli in the peripheral nervous system (e.g., hands). For example, in the realm of extreme food perceptions, a study that uses hot chili peppers as a trigger for the sensation of burning pain demonstrated the selective activation of sensory neurons that transmit information about noxious stimuli to the central nervous system (Caterina *et al.*, 1997).

Research area F: system interaction

Text mining in Stage 1 revealed the research area of system and interaction, described by the themes of *time*, *function*, and *system* and through the concept of target, connected to the theme of *sensory*. The themes of *time* and *system* are connected closely through concepts such learning and behavior. Although the concept of human also is an important element in system-related research, the theme of *time* constitutes the two additional concepts of data and size. The concept of data provides the connection to the third theme of *function*, which consists of the concepts of images, network, and performed.

Co-citation analysis in Stage 2 reveals that the most deeply rooted publications in this research area deal with object recognition, image matching, and image retrieval. Rubner *et al.* (2000) investigate perceptual metrics for content-based image retrieval with a focus on color and texture. Similarly, Lowe (2004) proposes the scale invariant feature transform (SIFT) method for extracting distinctive image features that allow matching between different views of objects or scenes. These publications seem strongly integrated with the computer science field (see Figure 2.6, Cluster 5). Connected studies in this field revolve around computer vision. One component of the SIFT method is local descriptors, which is a central topic in this field because it provides the basis for object recognition, texture recognition, and image retrieval. Mikolajczyk and Schmid (2004) assess the performance of various descriptors and find that the SIFT-based descriptors perform best. Dalal and Triggs (2005) focus on human detection to show that histograms of oriented gradient (HOG) descriptors perform best for this kind of detection. Relatedly, Bay *et al.* (2008) focus on camera calibration, proposing the speeded-up robust features (SURF) descriptor, which outperforms previously proposed schemes in this context.

An aggregate view across all three research areas reveals that sensory research beyond marketing takes a largely human perspective; it focuses on understanding the sensory neural system (Research Area D) and explaining how humans perceive food (Research Area E). Discussions of sensory processing strongly focus on understanding the sensory neural system, attention system, and motor system. The discussion of food perception strongly emphasizes how humans infer taste from extreme foods. However, Research Area F adopts a provider (i.e., developer) perspective, focusing on how to optimize systems for human stimulus

processing. Notably, the discussion of system interaction focuses on optimizing images for optimal processing and ultimately influencing behavior.

Additional investigation of the focal articles shows that publications in the sensory processing research area (Research Area D) are rooted mainly in neuroscience and cognitive psychology, with research focusing on understanding (1) the interplay between the sensory system and the attention system, (2) the role of emotions in this interplay, and (3) the interplay between the sensory system and the motor system. These research streams highlight stimulus-driven visual attention, multisensory input integration, emotional processing, and sensorimotor integration. Further, the food perception research area (Research Area E) mainly is rooted in food sciences, with research focusing on perceptions of extreme food items and auditory and thermal stimuli processing. Finally, the system interaction research area (Research Area F) is rooted mainly in computer science, with research focusing on object recognition, image matching, image retrieval, and (indirectly) local descriptors. Although all three research areas provide interesting avenues for investigating multisensory integration, the sensory processing area (Research Area D) seems to be the most established; it connects closely to the service research area. Therefore, insights from this cross-disciplinary analysis can be linked to important theories in neuroscience and cognitive science that address key research gaps in service research.

Findings

Our study is motivated by the need to identify clear pathways to developing a comprehensive understanding of the simultaneous occurrence and interplay of all five senses in a multisensory customer experience (Krishna *et al.*, 2017; Mahr *et al.*, 2019). To this end, it systematically explores extant sensory literature and constructs two status quo maps of existing research (i.e., within service and marketing and across relevant other disciplines), so that service researchers can learn and benefit from other domains. Table 2.1 provides an overview of key findings.

The text mining reveals that sensory research in service and marketing focuses mainly on three research areas: (1) atmospherics and sensory perception (Research Area A), (2) service environment and social interaction (Research Area B), and (3) customer- and firm-related outcome

Text mining results: service and marketing

Research areas	Atmospherics & sensory perception (Area A)	Service environment & social interaction (Area B)	Customer- and firm-related measures (Area C)
Key concepts	memory, food, scent, visual, sound, smell, taste, attention, consumption	social, individual, experience, human, process, market, culture, environment, space, body	consumers, sensory, product, offline, retail, brand, image, marketing, information, advertising, design, emotional, cognitive

Co-citation results service and marketing

Focal article topics	Effects of atmospherics on customer intentions experiences Role of scents in perceptions and memory Role of touch in customer perception and intention	Effects of culture and origin on perception and attitudes Design of experience-centric services	Volume perception and variety seeking Role of emotions in decision-making Customer choice behavior
Theoretical roots	Servicescape Environmental psychology	Brand origin, cognitive & affective perceptions Cultural dimensions and differences	Sensory attributes and brand switching Sensory stimuli and actual consumption
Theoretical roots	Haptic information processing and product perceptions	Service-dominant logic Service quality Dimensions of customer experience	Role of hedonic and utilitarian experiences Theory of planned behavior and reasoned action Commitment-trust theory of relationship marketing

Table 2.1 Summary of key results service and marketing analysis

measures (Research Area C). First, the discussion of atmospheric and sensory perception focuses mainly on key concepts such as visual, sound, scent, smell, taste, attention, and memory. The co-citation analysis shows that the most deeply rooted articles focus on topics such as the role of scent or touch on customer perception, memory, and purchase intentions. These topics have their theoretical roots in research on servicescapes, environmental psychology, and haptic information processing. Both text mining and co-citation analyses support the notion that service and marketing research has tended to study individual senses.

Second, the discussion of service environments and social interactions has focused mostly on the key concepts of human, space, body, experience, and process. In the co-citation analysis, the most deeply rooted articles focus on the effects of culture and origin on perceptions and attitudes or on the design of experience-centric services. These topics have their theoretical roots in research on brand origins, cultural dimensions and differences, the service-dominant logic, service quality, and various dimensions of customer experience.

Third, the discussion of sensory marketing and customer–firm interactions have focused mostly on the key concepts of sensory, information, relationship, cognitive, advertising, image, retail, and offline. The co-citation analysis reveals that the most deeply rooted articles focus on customer choice behavior, volume perception and variety seeking, and the role of emotions in decision making.

These topics have their theoretical roots in research on sensory attributes and brand switching, sensory stimuli of actual consumption, the role of hedonic and utilitarian experiences, the theories of planned behavior and reasoned action, and the commitment–trust theory of relationship marketing. Beyond marketing, text mining reveals that sensory research focuses mainly on three research areas: (1) sensory processing (Research Area D), (2) food perception (Research Area E), and (3) system interaction (Research Area D). First, research in the area of sensory processing focuses mainly on the key concepts of visual, auditory, motor, brain, cortex, neurons, and processing.

Text mining results: cross-disciplinary

Research areas	Sensory processing (Area D)	Food perception (Area E)	System interaction (Area F)
Key concepts	cortex, neurons, episodic, visual, auditory, motor, functional, brain, processing	products, sensory, food, freshness, taste, information, observed	system, function, time, images, network, human, data, behavior, learning

Co-citation results cross-disciplinary

Focal article topics	Interplay of sensory system and attention system	Perceptions of extreme food items	Object recognition
	Role of emotional processing	Auditory and thermal stimuli processing	Image matching
	Interplay of sensory and motor system		Image retrieval
Theoretical roots	Stimulus-driven visual attention	Neural basis of extreme food perceptions	Local descriptors
	Multisensory input integration	Neural basis of thermosensation	
	Emotional processing		
	Sensorimotor integration		

Table 2.2 Summary of key results cross-disciplinary analysis

The co-citation analysis shows that the most deeply rooted articles focus on topics such as the interplay of the sensory and attention systems, the role of emotional processing, and the interplay of the sensory and motor systems. These topics have their theoretical roots in research on stimulus-driven visual attention, multisensory input integration, emotional processing, and sensorimotor integration.

Second, the discussion of food perception focuses mostly on the key concepts of food, taste, and freshness. In the co-citation analysis, the most deeply rooted articles focus on perceptions of extreme food items, as well

as auditory and thermal stimuli processing. These topics have their theoretical roots in research on the neural basis of extreme food perceptions and thermosensation.

Third, the discussion of system interaction focuses mostly on the key concepts of system, images, and human learning. The co-citation analysis reveals that the most deeply rooted articles focus on object recognition, image matching, and image retrieval. These topics have their theoretical roots in research on local descriptors.

By combining insights from both maps, we not only identify research gaps in service research but also reveal the crux of multidisciplinary future research. Moreover, by drawing on important theories and methodologies that go beyond service and marketing research, we propose several avenues to move the field forward and contribute to a better understanding of multisensory customer service experiences (Table 2.2). Taken together, our two maps vividly display the vast room remaining for conceptual growth in sensory research in the service discipline. In particular, the service field requires the integration of additional theories and methods to aid in (1) understanding multisensory stimuli integration and perception, (2) understanding the role of emotions in multisensory customer experiences, and (3) understanding the influence of multisensory stimuli on behavioral outcomes. In the following sections, we highlight these three research streams, suggest some theoretical lenses, and offer specific research questions to advance multisensory customer experience research.

Future research agenda

Understanding multisensory stimuli integration and perception

Existing sensory research in service and marketing has addressed both offline (Biswas *et al.*, 2014; Massara *et al.*, 2014) and online (Kahn, 2017) service environments, focusing mainly on visual, auditory, and olfactory stimuli (Roschk *et al.*, 2017). A prominent topic in sensory research in marketing is visual attention, sometimes combined with another sensory modality (Krishna *et al.*, 2017). However, there is still a need to explore the interplay of all sensory modalities in complex servicescapes (Orth and

Research directions	Research area to advance	Research streams	Research questions
Understanding multisensory stimuli integration and perception	A/B	Multi-sensory integration	How do customers integrate multisensory stimuli in different contexts (e.g., website, store, mobile applications)? Hierarchically or sequentially?
	A/B		What is the role of multisensory integration in unfamiliar environments (e.g., new technology-driven servicescapes)?
	A	Visual attention	How can sensory stimuli be configured to optimize visual attention (interaction between customer's dorsal and ventral attention) networks and ultimately purchase behavior?
	A	Visual attention/multi-sensory integration	How can novel research methods (e.g., fMRI, fNIRS, EEG) be used to investigate visual attention and multisensory integration in retail environments?
Understanding the role of emotions in multisensory customer experiences	A/C	Emotional processing	What is the relationship between multisensory stimulation and different emotional states in customer experiences?
	A/C		How can visual emotional stimuli be used to enhance multisensory customer experiences?
	C		What roles do visual emotionally-valenced stimuli in artificial intelligence (e.g. service robots) play in customer-employee interactions?
Understanding the influence of multisensory stimuli on behavioral outcomes	B	Multi-sensory integration and behavioral change	What is the interplay of multisensory stimulation and embodied cognition in multisensory customer experiences?
	A/B/C		What is the role of emerging technologies (artificial intelligence, augmented reality, virtual reality) in multisensory stimuli integration to ease customer behavioral adaptation in new servicescapes?
	A/B/C		How can multisensory stimulation facilitate more health-conscious behavior? (What is its role in transformative service research)?

Table 2.3 Research gaps and future research directions

Suggested theories	References
Cross-modal correspondence	Spence (2011) Ernst and Banks (2002) Treisman and Gelade (1980) Corbetta et al. (2008); Posner and Petersen (1990)
Goal-directed attention Stimulus-driven attention Feature-integration theory	Hopfinger et al. (2000); Phan et al. (2002)

Cross-modal correspondence	Breiter et al. (1996); Gazzaley et al. (2005) Lang et al. (1998)
Emotional valence Stimulus-driven attention	Vuilleumier et al. (2004); Wirtz et al. (2018)

Embodied cognition	Ernst and Banks (2002)
Cross-modal correspondence	Haggard, Clark, and Kalogeras(2002); Krakauer et al. (1999); Scholz and Duffy (2018)
Goal-directed / stimulus-driven attention	Wolpert et al. (1995); Russell-Bennet et al. (2019)

Crouch, 2014; Spence *et al.*, 2014). Theories and empirical insights from neuroscience, cognitive science, and psychology can offer invaluable help. Research that focuses on sensory processing has established the role of neural systems, which bundle the input of all sensorial modalities (Angelaki and Gu, 2010). Neuroscientific research that simultaneously examines multisensory input integration could show activity in different regions of the brain, thereby demonstrating the effect of diverse stimuli across multiple sensorial modalities (cf. a singular modality) (Downar *et al.*, 2000). This research not only could show which modalities are activated but also reveal where customer attention is most prominent and which service provider-induced stimuli influence customer perceptions. Furthermore, among modalities, the role of the tactile modality seems rather absent in existing service research. A more comprehensive analysis of multisensory integration could offer more meticulous insights into the shaping of experiences (Aydiñgu and Krishna, 2019). In this regard, cross-modal correspondence is a theoretical lens that supports the goal of integrating diverse stimuli and combining them into perceptions; the theory bundles environmental stimuli across multisensory modalities (Spence, 2011).

From a neuroscientific perspective, attention consists of both dorsal and ventral attention networks (Corbetta *et al.*, 2008). Assessing the interplay of these networks might offer important insights into how customers direct their visual attention in servicescapes. From a theoretical perspective, goal-directed attention and stimulus-driven attention are two important lenses that facilitate exploration of which stimuli are at odds with customer perceptions and which stimuli trigger attention regardless of preexisting, goal-directed motivations and behavioral intentions. Similarly, feature-integration theory of attention relates to visual attention in unfamiliar environments (Treisman and Gelade, 1980); it could contribute to understanding of customers' visual attention in novel surroundings such as new servicescapes. Other relevant disciplines rely heavily on methods such as fMRI, functional near-infrared spectroscopy (fNIRS), and electroencephalogram (EEG) to tap into neural bases (Hopfinger *et al.*, 2000) these methods could facilitate similar levels of analysis when studying multisensory experiences.

Understanding the role of emotions in multisensory customer experiences

Another prominent topic that emerges from our analysis is the relevance of emotions in sensory marketing and service environment/social interaction research. By drawing on environmental psychology, researchers predict that consumers' emotional states mediate the link between atmospherics in the environment and consumer behavior (Poncin and Minoun, 2014). Although sensory marketing research largely has established the link between individual sensory stimuli and emotions (Mattila and Wirtz, 2001; Pham, 1998; Spence *et al.*, 2014), a multisensory perspective is missing (Helmefalk and Berndt, 2018). Because cross-disciplinary analysis reveals that multiple stimuli can simultaneously trigger diverse sensory modalities (Shams and Beierholm, 2010), studies of the effects of individual stimuli on customers' emotional states may be providing an incomplete picture. For example, Castellano *et al.* (2008) develop a multimodal approach that integrates eight different emotions according to facial expressions, body movements, gestures, and speech. According to cross-disciplinary findings, a need for holistic investigations of the relationship between multisensory stimuli and varying emotional states emerges. Existing service and marketing research focuses mostly on emotions as mediators of stimuli inputs and customer responses (Bagozzi *et al.*, 1999), whereas studies that go beyond discipline boundaries investigate emotions as stimuli triggers of human reactions. For example, Breiter *et al.* (1996) show that emotionally valenced stimuli in the form of facial pictures receive significantly more attention than neutral pictures. This form of visual suppression-specific attention (Gazzaley *et al.*, 2005) suggests new opportunities for customer engagement, beyond traditional, face-to-face customer-employee interactions.

For example, with regard to complex social and emotional tasks, though customers value physical interactions with employees more than interactions with robots (Wirtz *et al.*, 2018), they are increasingly appreciating service interactions in computer-generated shopping environments (i.e., virtual reality) that are less crowded (e.g., Van Kerrebroeck *et al.*, 2017). Research in both online and offline contexts is needed to gain a more comprehensive understanding of the interplay of multisensory simulation and emotional states and its effects on holistic multisensory customer experiences.

Understanding the influence of multisensory stimuli on behavioral outcomes

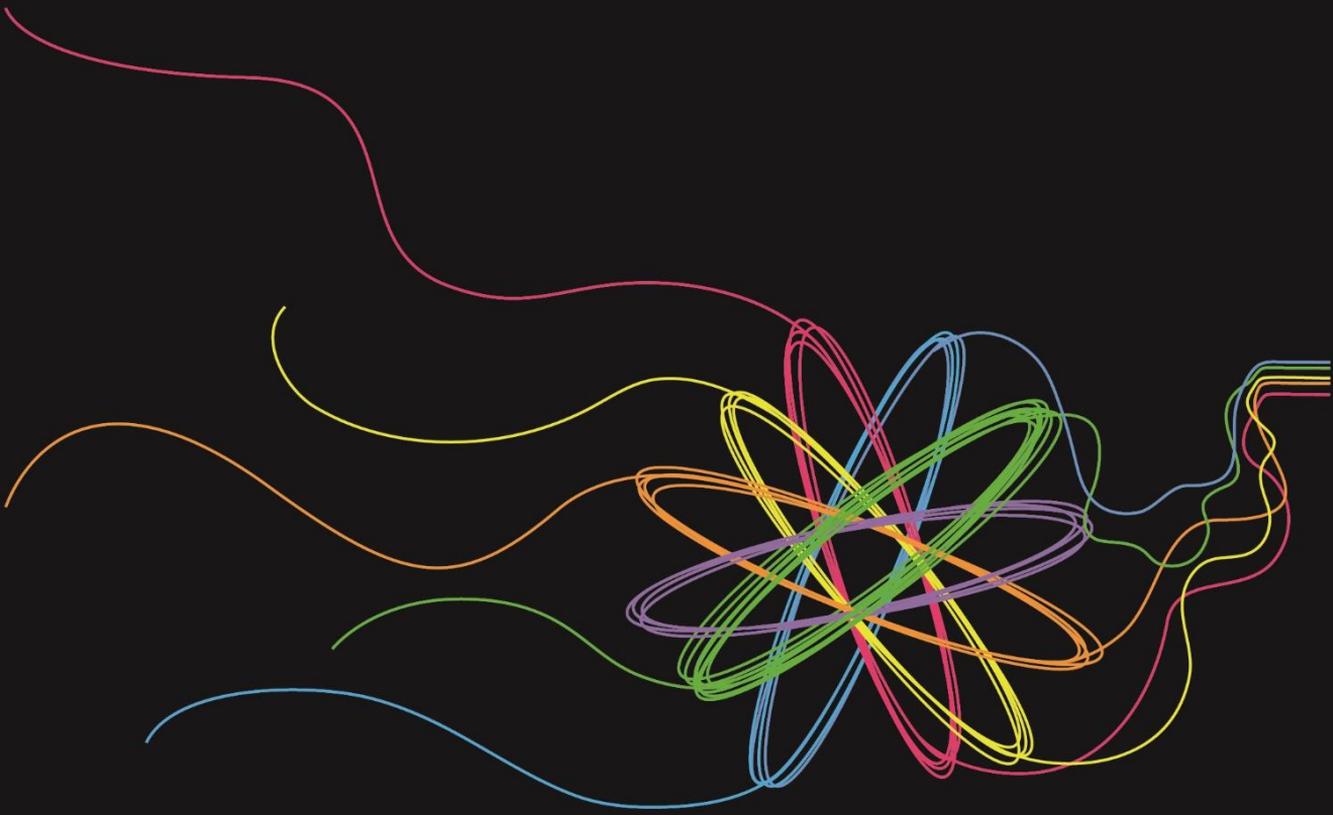
Text mining reveals that extensive service and marketing research has studied the influence of the service environment and social interaction on customer responses. Most studies have included quantifiable outcome measures, such as quality, positive and negative associations, purchases, category quantity, and price. A cross-disciplinary perspective highlights the need for finer-grained analyses of the internal process that ultimately guides customer perception and responses. Accordingly, research on embodied cognition (Borghi and Cimatti, 2010) demonstrates that customers' perceptions largely are influenced by body-related information that is derived from the exposure to service environments (Rosa *et al.*, 2016) and perception through the body itself (Yim and Park, 2019), known as somatosensory experience (Möller and Herm, 2013).

Cognitive science scholars suggest that relationships between sensory stimuli integration and embodied cognition depend on the interplay of the sensory system and the motor system (Haggard *et al.*, 2002). This underlying internal mechanism, which selectively integrates multisensory stimuli, facilitates a sequential learning process that ultimately enables us to understand service environments, especially new, innovative servicescapes. Finally, by building on Wolpert *et al.*, (1995) finding that sensorimotor integration enables stimulus processing that leads to planning, control, and learning of actual movements, researchers could explore how multisensory stimuli in unfamiliar service environments—in which customers must change their habits—can help customers understand, learn, and adapt their behaviors.

Conclusion

Multisensory customer experiences constitute a complex research topic that is receiving increasing attention in service and marketing research. Our study offers a comprehensive, cross-disciplinary review of sensory research. The results describe the status quo of sensory research, highlight gaps in research, and provide theoretically grounded avenues for future multidisciplinary research that transcends research boundaries and moves the field forward. Research-based answers to the agenda we present will advance understanding of multisensory customer experiences within and beyond the service context.

Manuscript 3



Unraveling Customer Experiences in New Servicescapes: An Ethnographic Schema Elicitation Technique (ESET)

Susan Stead, Dominik Mahr, and Gaby Odekerken-Schröder

Department of Marketing and Supply Chain Management, School of Business and Economics, Maastricht University, The Netherlands



Under review (2nd round) in the Journal of Service Management:

Stead, S., Mahr, D., and Odekerken-Schröder, G. (2020), “Unraveling customer experiences in new servicescapes: an ethnographic schema elicitation technique (ESET)”, *Journal of Service Management*.

Introduction

Service managers seek innovative ways to provide unique, memorable customer experiences that result in beneficial business outcomes (Bolton *et al.*, 2018). As new technologies emerge, servicescapes are becoming self-service environments (De Keyser *et al.*, 2019), dominated by self-service technologies (SSTs) that encourage customers to interact with machines and computers rather than employees (Field *et al.*, 2018). These SST innovations have profound impacts on customer experiences, in that customers must change and adapt to new servicescapes (Dedeoglu *et al.*, 2018). Therefore, it becomes critical to understand customer experiences within servicescapes as path-dependent and co-created (Bolton *et al.*, 2018; Kranzbühler *et al.*, 2017). In new or unfamiliar servicescapes, customers require knowledge to participate and adapt their behaviors (Wang *et al.*, 2012). For example, during new service encounters, such as paying with mobile devices for the first time, the information that guides consumers' responses flows from their memories (Sweller and Sweller, 2006), such that they combine incoming sensory information (i.e., stimuli) with past, remembered experiences, stored in memory (Spears and Yazdanparast, 2014). Customers' past experiences constitute knowledge structures, or *schemas* (Rentsch and Klimonski, 2001), that help the customers understand and evaluate service encounters along their customer journey (Lemon and Verhoef, 2016; Voorhees *et al.*, 2017). Therefore, to comprehend the influence of new servicescapes, researchers must understand the schemas that customers use in service encounters, which entails unraveling the customers' information from previous experiences that is stored in memory.

Although substantial service management and retailing literature investigates the influence of sensory information (e.g., atmospherics) on outcome measures, the process by which people select and connect this information with existing knowledge remains vaguely understood (Bustamante and Rubio, 2017). Most studies provide only snapshots of the holistic customer experience journey, using static measures (Lemon and Verhoef, 2016) that do not explain context-dependent, individualized interpretation processes. A particular lack of insight exists with regard to extended service transactions (e.g., air travel, hair styling), during which customers exhibit diverse cognitive, emotional, and behavioral responses to a multitude of interactions with servicescapes (Maguire and Geiger, 2015). With both conceptual and methodological foundations, this study

therefore seeks to establish schematic information processing as a key driver of customer experiences.

It contributes to theory and practice in three important ways. First, by introducing the concept of schemas to customer experience literature, this article clarifies how and why customers react to innovative and unfamiliar servicescapes. The conceptual framework details the process of integrating and matching sensory stimuli derived from servicescapes into existing knowledge structures—an inner process that ultimately determines customers' cognitive, emotional, and behavioral responses. Second, this study proposes, as a contribution to servicescape and atmospherics research, a novel *ethnographic schema elicitation technique* (ESET) that empirically shows how dynamic schematic information processing takes place at different touchpoints. This ESET goes beyond conventional methods, such as surveys; the complementarity of its various methods enables in-depth analysis and can disentangle the underlying mechanism of schema appraisal that delineates customer responses in highly innovative, unfamiliar servicescapes. This methodological contribution can help researchers address key research priorities, such as determining how increasingly complex technological ecosystems will affect the customer journey (Marketing Science Institute, 2018). Third, this study demonstrates how customers' existing knowledge, in schema form, can be updated and modified to elicit cognitive, emotional, or behavioral change. Such insights are particularly important for service managers and retailers.

Theoretical background

Servicescape and atmospherics research

In marketing and service research, two related streams of research—atmospherics and servicescapes—contribute to a clearer understanding of customer experience (Mari and Poggesi, 2013). Atmospherics refer to sensory stimuli that are designed and leveraged in service environments, with the goal of inducing customer purchases (Mehrabian and Russell, 1974). Retail atmospherics literature provides a more fine-grained understanding of the effects of sensory stimuli on customer senses (i.e., touch, sight, sound, taste, scent); servicescape literature paints a more holistic picture of customer–firm interactions and value exchanges in service settings (Edvardsson *et al.*, 2012). The concept of a servicescape

refers to the physical environment in which service is provided (*substantive staging*) and the interactions among actors (*communicative staging*) that jointly affect customer experiences (Pareigis *et al.*, 2012). The substantive staging of servicescapes consists of ambient conditions (e.g., temperature, lighting and music), the spatial layout and functionality (e.g., store furnishings), and the signs, symbols, and artifacts (e.g., style and decor) that constitute the diverse stimuli to which customers are exposed (e.g., Bitner, 1992; Dedeoglu *et al.*, 2018; Mari and Poggesi, 2013). Communicative staging of servicescapes refers to interactions among actors such as customers and frontline employees (Dedeoglu *et al.*, 2018).

Although substantial literature investigates the effects of substantive and communicative staging of servicescapes on customers' cognitive, emotional, and psychological states and their resulting behaviors (Pareigis *et al.*, 2012), few studies consider how customers transform stimuli into responses (Bustamante and Rubio, 2017). That is, existing servicescape and atmospherics research investigates sensory input and behavioral outcomes but does not explain how stimuli are integrated into existing knowledge structures that influence customer experiences. This "black box" of contemporary service and marketing research persists (Lipkin *et al.* 2016).

Black box of schemas in customer experience research

Mahr *et al.* (2019) propose that all customer evaluations are shaped by their processing of sensory information derived through human senses in servicescapes. Similarly, von Wallpach and Kreuzer (2013) argue that physical evidence (i.e., all tangible representations of services) can be derived only by capturing and processing sense-related stimuli such as sights, smells, sounds, tastes, and textures. Moreover, Helmefalk and Berndt (2018) propose an interdependent multisensory integration that determines experiences, emotions, and behaviors; this mostly subconscious mental operation connects sensory stimuli with existing memories (Plant and Stanton, 2013). The selection and processing of stimuli activates different associations in the memory (Greve *et al.* 2019) that then are stored as generic knowledge structures, which are referred to as *schemas* that guide the interpretation of external information (Plant and Stanton, 2013). From a cognitive science perspective, in simplest terms, schemas allow humans to organize and understand phenomena (Taylor and Crocker, 1981).

In the realm of service management and marketing literature, Åkesson *et al.* (2014) introduce schemas as knowledge structures of shared norms and rules that guide customer behavior and enable value co-creation in the service ecosystem. To extend understanding of the role of schemas in servicescapes, this article goes beyond Åkesson *et al.*'s (2014) application of schemas as shared knowledge structures (i.e., societal norms and rules) to take an explicit perspective on individual schemas that emerge from servicescapes. Rather than focusing on generic or commonly shared schemas, it disentangles context-specific schemas (constituting prior experiences) at the moment of activation. As such, we provide that these schemas are the foundation of knowledge construction and enablers of subsequent inferences such as cognitive, affective, and behavioral responses. Although customers are exposed to thousands of stimuli within servicescapes, they are meaningless unless integrated into cognitive contexts (Turner, 1986). Schemas provide cognitive contexts that contain general knowledge about attributes and specific examples that result from past experiences and help specify the meaning of selected stimuli (Dedeoglu *et al.*, 2018). The critical connection between processed sensory stimuli and the activation of schemas determines customers' situational experiences (Axelrod, 1973).

Conceptual development

Schema characteristics

This article moves beyond service and marketing research to propose *attention schema theory* (Webb, and Graziano, 2015) as a theoretical lens for understanding the role of schemas in shaping customer experiences from a dynamic journey perspective. The complexity of information processing necessitates a closer look at schema characteristics, because schemas are key to understanding human knowledge creation and the basis of customer experience (Tayler and Crocker, 1981). Schemas, the study of which is grounded in sociology and anthropology, are humans' most important tools for making sense of the environment (Axelrod, 1973). They decrease the mental effort required to interpret and judge situations and generate and organize knowledge (Richardson and Ball, 2009). When customers are exposed to sensory stimuli in servicescapes, they link those stimuli to already established cognitive categories (i.e., schemas) that are

stored in their memories and guide their cognitive processes (Harris, 1994). For example, broadcasting a particular sound through the speakers at a train station activates travelers' schema, such that they anticipate an announcement from the operating company will follow.

Schemas are dynamic too; they evolve with experiences (Taylor and Crocker, 1981), are triggered automatically, and are used temporarily (Harris, 1994). These flexible, personalized heuristics (i.e., mental shortcuts) determine thoughts and actions (Richardson and Ball, 2009). Schemas possess four features (Ghosh and Gilboa, 2014): First, they have an associative network structure, such that they depend on multiple components and interrelationships of those components, so each schema is connected to others through associations. Second, they form on the basis of multiple episodes. Crucially, they consist of higher-order constructs that represent similarities and differences related to multiple events. single, unique events. Third, in line with the first two features, they lack unit detail; they are general enough to fit multiple events and serve as hubs to which new information is connected. For example, the schema of "belt" could be activated to provide information for different purposes, such as a check-out terminal belt, as opposed to a conveyor belt in a distribution center. The transportation process of steadily moving goods from one place to another is the same, yet distinct associations for both processes are formed. Therefore, as a fourth characteristic, schemas need to be flexible and adaptable.

Activating and connecting schemas

Schemas follow a pyramidal, hierarchical structure, in which the top level denotes general, abstract information and the lower levels consist of specific facts or existing examples and instances in which schemas have been used before (Taylor and Crocker, 1981). At lower levels, schemas consist of components that serve paired associations, events, or features (Ghosh and Gilboa, 2014). This network structure is necessary, because schemas form by connecting diverse information that results from multiple schemas (Harris, 1994). For example, for events such as "grocery shopping," customers rely on multiple schemas that follow particular structures composed of detailed actions that also may be relevant to other schemas. The level of detail is like a pyramid, with the most aggregated schema information at the top and the most detailed at the bottom, as in Figure 3.1. Schema activation can take place at any level of the pyramid and

does not have to flow from top to bottom. Stimuli activate schemas at different layers, so the sound of a bell might trigger an encounter-specific schema associated with opening a supermarket check-out line, even though the customer is in a very different setting such as an airport.

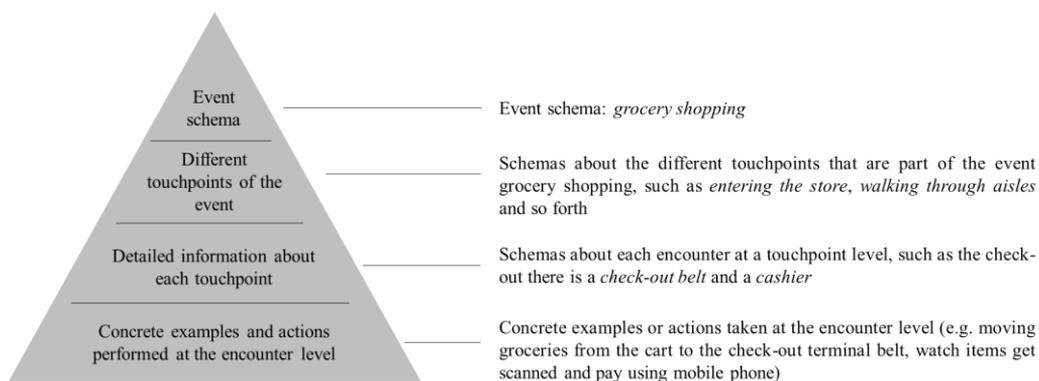


Figure 3.1 *Pyramidal, hierarchical structure of a grocery shopping event schema*

In Figure 3.1, the schema activated at the highest and most abstract level is the event schema. At the more detailed, second-highest level, there are multiple components that provide information about various event touchpoints. At the third level, more detailed information about each encounter at a particular touchpoint emerges, and at the lowest, most detailed level, there are concrete examples and actions taken by the customer. This information is known and gained from multiple previous experiences, stored as schemas in the customer’s memory, as an individual-level, subjective script about the process and activities involved. Each schema also can connect with others that are part of different event schemas, in accordance with the network structure.

In providing a framework for assessing experiences, schemas guide the encoding of sensory information and enable subjective retrieval of memories. They also provide structures for filling in missing knowledge, and they affect cognitive, affective, and behavioral responses. Because schemas contain both conceptual and experiential prior knowledge of external stimuli, as well as being individual and context-specific, not all schemas are relevant, and not all schemas are activated in all situations (Rentsch and Klimoski, 2001).

Conceptual framework

By reviewing literature and linking the concept of schemas with key theories from psychology and cognitive science, this article conceptualizes schema processing as a fundamental basis of the customer experience, in an effort to open the black box pertaining to how stimuli are integrated into customers' inner schematic knowledge structures through the four interrelated stages in Figure 3.2.

Stage 1: Activated senses notice stimuli

In Stage 1, a customer consciously or subconsciously perceives selected stimuli through one or more of the five human senses (touch, smell, vision, hearing, and taste). Customer knowledge creation follows an interpretive, socially constructed approach (Gioia and Chittipeddi, 1991), so the meaning customers assign to stimuli at the encounter level is subjective and constrained by the context (Webb and Graziano, 2015). Attention schema theory provides a useful explanation; it posits that the brain selectively augments the most prominent and urgent incoming stimuli and then consciously or subconsciously relates them to existing memories (Greve *et al.*, 2019). Frödin (2017, p. 96) defines attention as the process of:

binding together prevailing sensory data, be they visual, emotional, cultural, or action oriented, stemming from interconnected brain modules and networks, and/or to varying degrees produced, enhanced or suppressed by specific social, cultural or situational aspects, into a single, unified representation, or a single coherent state.

Translating this definition to service research, this definition suggests that the subjective selection of sensory information is determined by servicescapes and socially and culturally constructed norms and values (Åkesson *et al.* 2014). Sensory stimuli, determined by context and situation, are processed and connected to existing experiences that are stored across multiple schemas.

Stage 2: Matching stimuli with existing schemas

This process of connecting encountered stimuli to the activation of evoked sets of schemas represents the transition to Stage 2. Incoming sensory information is encrypted and matched against an evoked set of schemas

(Taylor and Crocker, 1981), stored in two types of memory: *episodic* and *semantic* (Greve *et al.* 2019). Episodic memories are prior experiences that are stored as event schemas, and semantic memories entail lower-level schemas such as touchpoints, encounters, and contextually related facts, examples, and activities (Greve *et al.*, 2019). Both memory types can be activated concurrently (Spears and Yazdanparast, 2014), thus the activation of an event schema and some lower level schemas, for example touchpoint information of the event. By matching stimuli with schemas, customers can understand and interpret stimuli configurations in servicescapes. Each schema stores only limited knowledge, so an action sequence such as “grocery shopping” requires a large set of schemas to be retrieved.

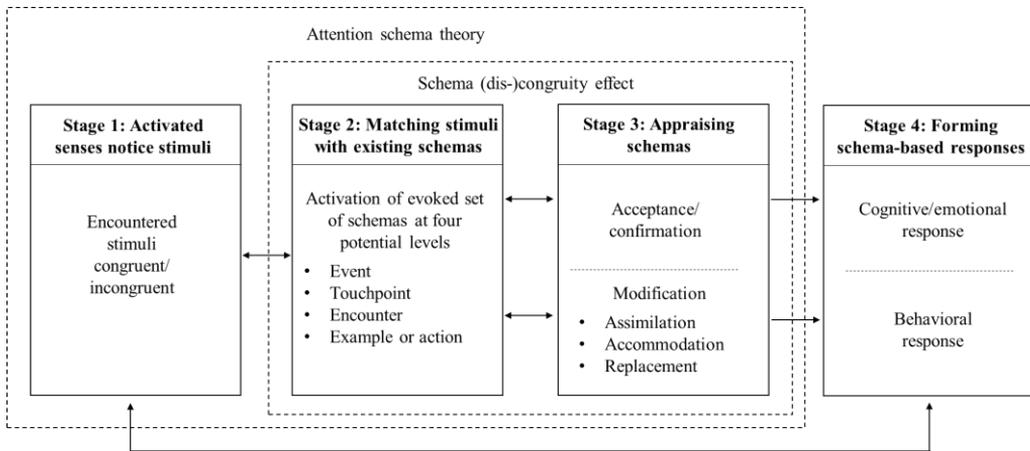


Figure 3.2 Conceptual framework: schematic information processing

Stage 3: Appraising schemas

In the transition from Stage 2 to Stage 3, customers try to match stimuli with sets of schemas, resulting in either confirmation or modification of existing schemas. When sensory information easily matches existing knowledge, customers retrieve schema confirmations. In contrast, ambiguous, inconsistent, or unknown sensory information leads to the modification of schemas at three degrees of change—*assimilation*, *accommodation*, or *replacement*—that range from marginal to significant (Gilboa and Marlatt, 2017). Figure 3.3 depicts these processes.

Assimilation occurs when customers integrate new environmental information by building on or combining existing networks structures of schemas (Taylor and Crocker, 1981). For example, using public transportation in an unknown city requires the assimilation of existing schemas with novel information about where to buy tickets or how to indicate the desire to disembark. Accommodation results if servicescapes demand that customers reshape their existing schema to fit events. They thus require more cognitive involvement from consumers and usually takes place in unfamiliar servicescapes, such as switching for the first time from a printed boarding pass to a mobile e-boarding pass. In the replacement stage, customers notice that existing schemas are inadequate, provide wrong or outdated information, and do not match the current encounter. The existing schema needs to be replaced.

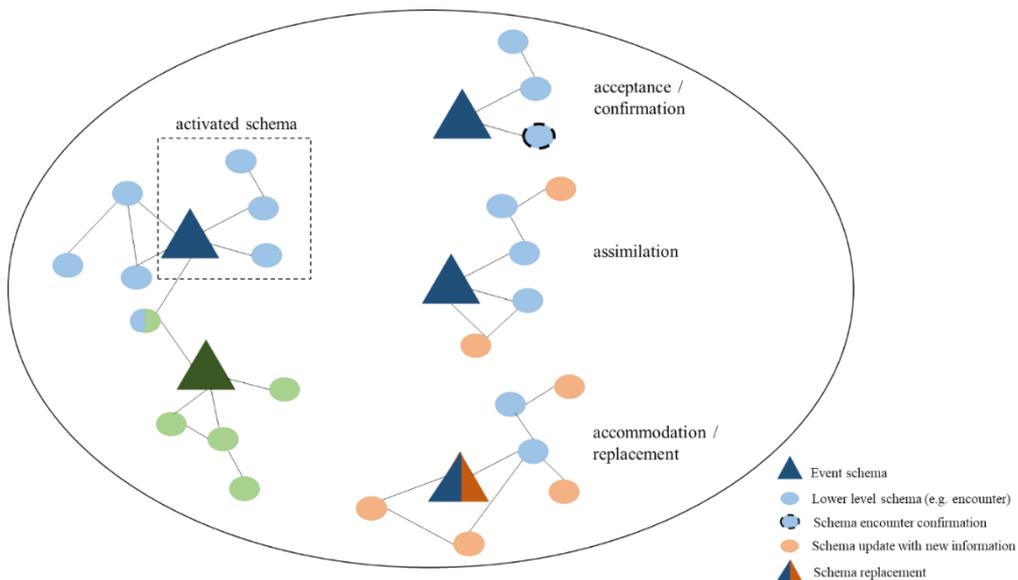


Figure 3.3 Visualization of schema appraisal

Although schemas provide mental shortcuts for customers, they also impose boundaries on comprehension. When stimuli cannot be linked adequately to existing schemas, multiple cognitive memory scanning iterations take place (Hastie and Kumar, 1979). Sensory information that is consistent and matches existing schemas can be processed easily; incongruent sensory information requires an amplified level of cognitive

involvement, because it is more difficult to process (Tayler and Crocker, 1981), which is a *schema (dis-)congruity effect* (Noseworthy *et al.*, 2014).

Stage 4: Forming schema-based responses

Extant literature addresses the schema (dis-)congruity effect on knowledge formation and memory enhancement (Barlett, 1932; Greve *et al.*, 2017; Peracchio and Tybout, 1996). Whereas Helmfolk and Berndt (2018) argue that multiple stimuli that are congruent (auditory, visual, olfactory) have a more positive effect on emotions and behavior, Peracchio and Tybout (1996) find that when customers have limited knowledge about products and their sensed attributes are moderately incongruent with existing schemas, they evaluate the products more positively. Similarly, Mandler (1982) shows that stimuli that conform with expectations are not arousing, because familiarity evokes light responses, but incongruent stimuli evoke strong arousal and cognitive processing to encode the stimuli. Depending on the level of incongruity, existing schemas can be assimilated or accommodated (Peracchio and Tybout, 1996). Assimilation leads to congruous stimuli configurations, and the updated schemas provide grounds for cognitive or behavioral responses at the moment, and then get stored in episodic and/or semantic memory for customers to retrieve in future encounters (Mohammed *et al.*, 2000). In contrast, accommodation and replacement require deeply rooted mental changes that may remain unresolved.

While schematic integration constitutes the inner realm, Stage 4 of the conceptual framework entails customers' cognitive, affective, and behavioral reactions. The knowledge that results from multisensory stimuli integration with schema configurations guides human responses and bodily actions (von Wallpach and Kreuzer, 2013). In the literature the embodied cognition, implies that the body shapes the mind, and the mind shapes bodily actions (Clark, 1998). Frödin (2017) shows that people connect encountered stimuli with existing schemas, which leads to an implicit connection between body-related and awareness-related schema that guides cognitive, emotional, and behavioral responses. Accordingly, schemas serve as knowledge structures that guide customer perception and drive behavioral responses, such as movement and motor activities (O'Reilly, 2012). Thus, in Stage 4, awareness forms in the conscious mind, and body-related schemas provide instruction for body movement and control (Webb and Graziano, 2015). For example, the sight of a green traffic light activates people's body-related schema of walking across the street.

To summarize, the interaction with the servicescapes, requires the customers to actively or passively scan the environment, select stimuli, and attachend them to existing schemas. The connection of multiple schemas provides the customers with a scripts for cognitive, emotional, and behavioral responses that follow.

Methodology

Research context

In competitive retailing sectors, emerging technologies have fueled the development of diverse innovations aimed at creating shopping experiences that set a retailer apart from its competitors (Terblanche, 2018). The empirical context of this study involves a large European supermarket chain that offers a variety of SSTs, including a mobile application (app) that extends the customer journey beyond the physical store and changes multiple touchpoints significantly. Using this app, customers can, prior to the actual store visit, create shopping lists or search for [discounted] products, then during their shopping trips to actual stores, they can scan items and generate barcodes to use to pay at self-check-out terminals.

This recently launched SST provides a suitable context for testing the proposed conceptual framework for several reasons. First, the app introduced a different type of customer interaction, within and beyond the general service environment. From a customer journey perspective, it changed multiple touchpoints and required customers to learn and adapt their habits and behaviors. For example, it replaced interactions with frontline employees with interactions with technology. Second, its recent launch (in September 2019) ensured all participants in the study were first-time users, so it was possible to identify obstacles and challenges that might have resulted in perceived service failures (Wang *et al.*, 2012). Third, the extended service transaction required a more temporal perspective at the encounter level (Maguire and Geier, 2015). Notably, schemas that serve as grounds for information processing have a particularly crucial role in service encounters. Fourth, SST apps that extend service offerings beyond actual retail stores, a setting it which it often is difficult to capture customer experiences along the journey (Wang *et al.*, 2012). The context- and encounter-specific activation of schemas, together with the

individualistic nature of the evoked set of schemas, creates substantial complexity. Therefore, to understand schematic information processing as a fundamental basis for the dynamic customer experience, the research approach goes beyond conventional customer surveys or interviews.

Research sample and design

The research was conducted between September and November 2019, involving 42 participants. The age distribution of the sample was between 16 and 56 years; 80% of participants were students in the age range of 20 to 30 years. According to recent market surveys (Nielsen, 2015), this generation of digital natives is skilled and motivated with the use of technology for shopping and therefore offers an appropriate target group for the new app. The initial sample selection questions also revealed that participants in the remaining 20% of the sample considered themselves technologically inclined and mobile technology savvy.

An empirical, semi-inductive, exploratory study introduced the participants to ESET, as an extension of traditional ethnographic research. Qualitative ethnography, grounded in anthropology and sociology, requires a researcher to study the practice of social life, cultures, and values extensively over an extended period of time (Elliott and Jankel-Elliott, 2003), through sustained contact with participants, both active and in the form of participant observation and reflection from the researcher (O'Reilly, 2012). Contemporary ethnography in various social science disciplines (Brewer 2000) often is conducted in everyday settings, drawing on multiple methods, with the goal of understanding people's perceptions, actions, and behavior (O'Reilly, 2012). Ethnographic research offers a successful means to learn about and gain detailed understanding of complex social phenomena and personal experiences that result from them (Adler and Adler, 2007).

The proposed ESET combines several purposeful data collection methods, through multiple iterations, to identify schemas at the touchpoint level, as well as processes of modification and customer responses: participatory observation (extensive field notes, photographs), semi-structured and in-depth interviews, and visual card-mapping activities. The combined methods generated detailed insights into the customer experience across multiple touchpoints according to social, psychological, and emotional processes (Bolger et al., 2003). The in-depth interview of each participant (customer) was conducted immediately after a customer journey, matched

with participatory observations, so the lag between the event trigger and its measure captured experiences at the encounter level. Furthermore, combining touchpoint cards and emotional cards uncovered tacit knowledge by actively involving participants in mapping activities. Table 3.1 summarizes the data collection stages and their purposes.

ESET	Purpose
Interview Part I	Capture initial associations, in form of schemas, during first exposure to the service innovation
Participatory observation	Understand experiences by engaging in activities and practices and observing what is happening in the surroundings (e.g., stimuli and activated senses) and what cannot be expressed in words by participants (e.g., gesture and mimicry)
Interview Part II	Understand schema confirmation and modification and identify involved customer activities by capturing in-depth social, psychological, and emotional drivers immediately following completion of the customer journey
Touchpoint mapping	Map relevant touchpoints for the participant along the customer journey to obtain a holistic perspective
Emotional journey mapping	Capture emotional states at the encounter level; match these states with interview insights to obtain more thorough understanding

Table 3.1 Overview of ethnographic schema elicitation technique (ESET)

Semi-structured in-depth interviews

Participant interviews took place in two parts. In the first, participants answered a series of questions (Block 1 and Block 2 [see Appendix I]) prior to using the app. They were then exposed to the service innovation (app) for the first time and queried about their initial thoughts and perceptions. This interviewing method captured their initial, most prominent perceptions (personal stories) (Gremler, 2004). The second part of the interview took place immediately after the participants left the store. The interviews ranged from 15 to 30 minutes in length.

Participatory observation

A classic form of participatory observation involves researchers entering environments with participants and learning by engaging in routine activities (O’Reilly, 2012). However, Pink (2015) suggests subtler forms, noting the importance of multisensory and emplaced experiences, in which researchers derive knowledge from their own experiences and the experiences of participants, as well as include all senses to avoid domination of the visual perspective. In this study, according to Pink’s (2015) *emplaced sensory participation* approach, a researcher co-participated in the servicescape, experiencing service encounters along with the participants. Participants explored the service innovation by themselves, but the researcher followed, observed what was happening, and verbally interacted with participants, without giving instructions. This participatory observation revealed some tacit knowledge, reflecting both observed and experienced stimuli in the servicescape and the gestural or mimicking reactions of participants. The researcher took extensive field notes, which were enriched with photographs and sketches taken by the researcher.

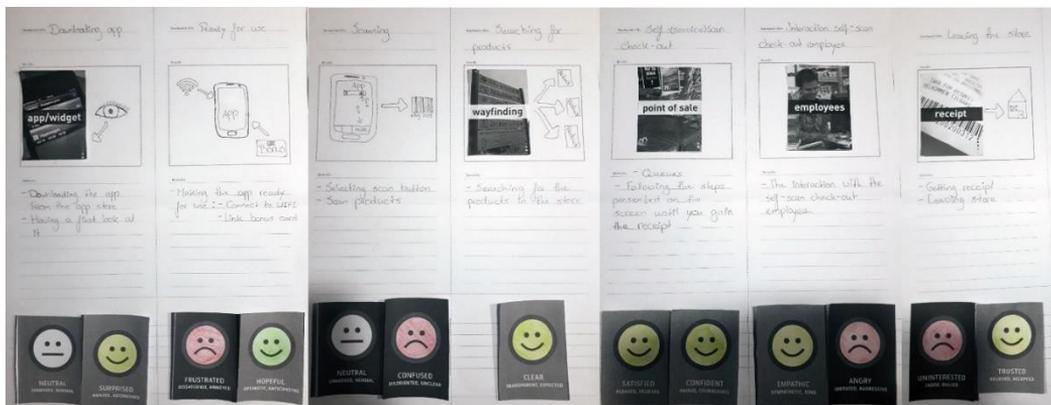


Figure 3.4 Example of touchpoint and emotional-journey mapping activity

Touchpoint and emotional card mapping

In a co-creative follow-up task, the researchers asked the respondents to map all touchpoints they encountered as part of their customer journey; AT-ONE (Clatworthy, 2010) touchpoint cards served as a starting point, but participants were encouraged to draw additional touchpoints when they did not find matching cards in the deck. Next, the researchers asked

participants to map their emotions along the previously identified touchpoints (for an example, see Figure 3.4). The data collection process resulted in 298 pages of transcripts.

Analysis

The data were analyzed using an iterative approach of open coding and constant comparison techniques (Strauss and Corbin, 1990) with the goal of identifying (1) important touchpoints in the customer journey, (2) encountered stimuli, (3) activated schemas at the encounter level, (4) customer activities performed, and (5) cognitive, emotional, and behavioral outcomes. Thus the conceptual framework is illustrated by Coding Stages 2–5, across the customer journey (Coding Stage 1).

In the initial round, three researchers independently read the transcripts and assigned codes to each of the five categories (customer journey touchpoint, sensory stimuli, schema, activities, and outcomes). The authors then conducted an analysis session in which they compared first-order codes and developed a more aligned coding scheme that resulted in second-order codes (Johnson and Sohi, 2016). After re-reading the corresponding sections of the transcripts and re-defining the code categories, they again compared the second-order codes and discussed them until they achieved alignment and agreement.

Results

Identifying the most prominent touchpoints enabled a categorical, meaningful clustering of schemas. The Stage 1 data coding process initially resulted in 20 touchpoints which the research team reduced to six touchpoints and specific customer actions at the touchpoint level (Table 3.2). The six touchpoints, in the top row of Table 3.2, are the most prominent ones mentioned and mapped by participants. In Stage 2, the researchers coded the most prominent sensory stimuli and schemas at the touchpoint level, as listed in the second row 2 of Table 3.2. Next, key activities performed at the touchpoint level (data analysis Stage 3) and emotional journeys (Figure 3.4) that were co-creatively mapped are aggregated into four distinct colored “smileys” that range from green (“very happy”) to red (“very unhappy”). In Table 3.2, any co-presence of two smileys indicates a deviation in customer perceptions, such that some

customers perceived the schema or activity as positive, whereas others perceived it as neutral or negative.

To illustrate the role of schemas in shaping customer experiences in new servicescapes, the remainder of the result section is divided into two parts. The first part provides example narratives describing customer activities, encountered stimuli, and various schemas at the touchpoint level, linked to Stages 1 and 2 of the conceptual model (Figure 3.2). In the second part quotes detail how schemas are modified and customers form distinct responses, which relates to Stages 3 and 4 of the conceptual framework.

Stages 1-2: Encountered stimuli and activation of evoked set of schemas

Touchpoint: Initial opening and exploration of app

After downloading the app, participants started to explore the options by clicking. In addition to providing two scanning functions—add products to a shopping list and add products to the shopping cart—the app supports recipe exploration, shopping list creation, store finding, and many other functions. The most prominent schemas that could be identified across all participants were *user manual*, *app navigation*, *scanning trial*, *language modification*, and *recipe inspiration*. Particularly in this exploration phase, customers activated schemas that came from different contexts:

This app somehow reminds me of my local post application. The scan icon on the main menu of the grocery store app is the same as the one of the post. In the post application, you can scan the bar code of your parcel in order to track and trace your shipment. (P26)

The visual stimuli of the scanning icon triggered a schema associated with parcel shipping and related activities. The most dominant activities performed at this touchpoint included clicking through the app, trying to switch to a different language, exploring recipes, and trying to test the scanning function before actually shopping (Table 3.2). The most dominant senses activated during this exploration phase were vision and touch. Customers were triggered by visual stimuli and clicked through the app to find, for example, the icon of the scanning function:

Based on previous experience with mobile payment apps is that it's too crowded in the sense of too many options in the app so

you're tempted to not use the self-check-out function. It makes me feel confused and I'm losing interest. (P19)

Not as easy as it could have been to find the self-scan function. (P36)

These comments show that in the exploration phase, customers try to make connections with existing schemas, such as user manuals, tutorials, or knowledge structures from mobile payment events that help them understand the app. Furthermore, existing schemas result in unmet expectations, such as the unnecessary difficulty of locating the scanning function in the app, mentioned by one participant.

Touchpoint: Shopping preparation

After familiarizing themselves with some of the app features, customers started to browse through the product assortment and prepare for their shopping trips, such as by reading product information, browsing through discounted items, and creating shopping lists. The most prominent schemas that emerged were *comparing products*, *discount hunting*, and *selection of grocery items*. For some customers, the app features were straightforward, whereas for others its value to their general shopping habits and activities was less obvious:

I like that you can get a discount on some items that you really need. This is a stimulus to go to a specific supermarket. Searching for all the discounts that you can possibly get on some items is in my experience quite fun. (P30)

I'm a little clueless as what to do with it now, I can see some special offers, recipes, and a shopping list, so it seems useful for planning purposes. (P3)

The most prominent stimuli were visual. Although, the senses vision and touch played a crucial role, it can be anticipated that clicking through the product assortment of groceries also may have also triggered other senses (e.g., taste, smell) through existing schemas (Okajima *et al.*, 2016). The extended service interaction, such as browsing products and discounts and creating digital shopping lists, seemed to trigger the schema of selecting grocery items, which involved the activity of browsing through the product assortment and adding products to the digital shopping list:

Touchpoint	Stimuli	Schema	Activity
Initial opening & exploration of app	Visual Touch	User manual 😞	Click through app 😊😊😊
		App navigation 😊😊	Try switching to different language 😞
		Scanning trial 😞	Explore recipes 😊
		Language modification 😞	Try testing scan function before shopping 😞
		Recipe information 😊	
Shopping preparation	Visual Touch	Comparing products 😊	Reading product information 😊
		Discount hunting 😊😊	Browsing through discounted items 😊😊
		Selection of grocery items 😊	Creating a shopping list 😊
In-store set-up	Visual Touch Auditory	App configuration 😞	Seeking assistance 😊😊
		Scanning operationalization 😞	Connecting to store Wi-Fi 😞
		User manual 😞	Scanning bonus card 😊😊
			Identifying & opening self-scanning function 😞
Navigate through the store	Visual Touch Auditory Olfactory	Store familiarity 😊	Walking through aisles 😊
		Crowded aisles 😞	Searching products 😊😊
		[Fresh] food selection 😊😊	Picking products from shelves 😊😊
		Staff interaction 😊😊	Asking for help 😞😊
			Choosing products 😊😊
Scanning products	Vision Touch	Open scanner 😞	Engaging in communication 😊😊
		Prior scanner 😊	Opening the scan function 😊😊😊
		Store hand-scanners 😊😊😊	Operating the scanner 😊
		Phone scanning 😊😊😊😊	Phone and product handling 😞
			Weighing products 😞😊
Proceed through check-out terminal	Vision Touch Auditory	Check-out queue 😞	Scanning barcodes 😊😊
		Self-check-out terminal handling 😊😊😊😊	Queueing at check-out terminals 😞
		Scanning at check-out 😊😊	Generating a barcode 😊
		Payment function 😊😊	Seeking help 😊😊
		Supermarket security control 😊😊	Clicking on terminal icons 😊😊
			Selecting payment option 😊😊
	Scanning a barcode 😊😊	Validating purchases 😊😊	
		Paying the groceries 😊😊	
		Scanning receipt barcode to exit gate 😊😊	

😊 very happy 😊 somewhat happy 😞 somewhat unhappy 😞 very unhappy

Table 3.2 Overview of findings

It's cool to have a shopping list function that also makes suggestions and allows you to choose from the suggestions as you type a word. Using the list function is more exciting than writing a normal shopping list with pen and paper. (P36)

I like that you can see specials [deals] that are discounted. It reminds me of an online brochure of a supermarket. (P37)

These comments also show how existing schemas, such as *shopping list* or *digital brochures*, can be modified by new information, as discussed subsequently.

Touchpoint: In-store set-up

Customers encountered several obstacles in setting up all necessary connections to operationalize the application and begin the actual product scanning process. To start the scanning process on their mobile phones, customers needed to obtain bonus cards, scan the cards, connect to the store's Wi-Fi, and accept the terms and conditions; only then could they open the scanning function that added products to the digital shopping cards. Schemas associated with this process were *app configuration* and *scanning operationalization*. The component activities were seeking assistance (from supermarket staff or shopping companions), connecting to the store's Wi-Fi, scanning store bonus cards, and identifying and opening the self-scanning function via the app:

After a while, I finally found the exact self-scan function. I clicked on it and the app required me to connect to the supermarket's Wi-Fi and scan my bonus card. I forgot my bonus card at home so I must put back my shopping basket, return to the customer service counter to ask for another card in order to use the self-scan function. (P32)

The set-up of the app caused particular frustration for participants, because they were missing clear operationalization instructions, which required more time investments before actual scanning or shopping could take place:

I scrolled up and down and tried to find out where to scan products. I first clicked through the bar at the bottom and then found the search bar where you were able to scan products. (P2)

A re-occurring schema at this touchpoint was the missing *user manual*; customers had to use trail-and-error efforts to activate the self-scanning function:

There is no “instruction” tutorial to show you which bar code to scan. The correct bar code to scan also differs between products that “naturally” have a bar code (e.g., milk) and others that don’t (e.g., cucumber). (P35)

The customer came to this conclusion after repeatedly scanning the products themselves or the shelf signs of the products.

Touchpoint: Navigating through the store

The touchpoint of customers navigating through the store refers to key activities such as walking through the aisles, searching, choosing products from the shelves, asking for help, choosing fresh produce, and engaging in communicative interactions with staff or other customers. The most prominent schemas are *store familiarity*, *crowded aisles*, *fresh food selection*, and *staff interaction*. The schemas of *store familiarity* and *(fresh) food selection* include information about where particular products are located and which attributes, according to the customers, fresh fruit should contain. Both schemas are strongly linked to the activated senses of vision, smell, and touch:

I enjoy walking around and getting inspiration for meals to cook by looking at the different products in the shelf. Knowing where everything is located in the supermarket, it makes me feel “at home.” (P34)

I really feel comfortable shopping in the supermarket since the smell of freshly baked bread makes me feel happy and relaxed somehow. (P25)

I always try to check freshness by touching the products. (P22)

Whereas the schemas of *store familiarity* and *fresh food selection* prompt positive emotions (Table 3.2), the schemas of *crowded aisles* and *staff interaction*, as part of customers’ social and physical surroundings, evoke mixed emotions that tend toward negative:

I also don’t like when I can’t find products that I usually don’t buy because then I have to go back and forth looking for it. It’s even

worse when you ask employees where something is and they don't know themselves. (P34)

I don't like people who are blocking entire shelves while they can't decide what to pick, while you stand right behind them and know, and even see, exactly what you want to have. (P1)

Touchpoint: Scanning products

The touchpoint of scanning products involved the activities of opening the scan function, operating the scanner, simultaneous phone and product handling, weighing products, and scanning barcodes. In the app, the self-scanning function accesses the customer's phone camera; through the camera, the customer scans the barcode on a product, which is then automatically added to the customer's shopping cart. After each scan, the customer can see information about the product on the app and the total number of all products that have been scanned. The most dominant schemas to emerge from coding this touchpoint were: *open scanner*, *prior scanning*, *store hand-scanners*, and *phone scanning*. Participants encountered particular obstacles with regard to the schema of *open scanner*:

First, I tried to figure out the location of self-scan function in the app. I first clicked on the self-scan button on the main screen and scanned one product. However, I figured out that this button may be wrong since it just showed me the product information and it didn't add anything into my shopping list. After a while, I finally found the exact self-scan function. (P32)

Visual stimuli and activated senses of vision and touch were particularly important at this touchpoint. Because the scanning function was somewhat hidden in the app's sub-menu, participants searched for symbols that fit with existing information and clicked through the app. For example, one participant was able to operationalize the scanning function by using the activated schema of *prior scanning*:

I have used the self-scan option already; not with the smartphone, but with the scanner you can pick up at the entrance of the store, at my supermarket back home. It reminded me of that. The app itself did not remind me of that, but rather the thought of what I can do with the app afterwards did. (P39)

The actual scanning with the phone was unfamiliar to customers and required multi-tasking by simultaneously holding the product, the phone, and in some cases a basket or bag:

Handling the basket and the phone simultaneously while scanning is annoying and hard, felt overwhelmed I had to hold my groceries, and my phone, and my card, you I could have used an extra pair of hands. (P14)

Because the scanning of items with their mobile phones was new to all customers, their emotions ranged from anxiety, anger, and stress to curiosity and excitement:

Because it was the first time [using the self-scan app], you constantly had to remind yourself to scan all the products, maybe gets easier with experience. I was worried that I forgot to scan something. (P4)

Touchpoint: Proceed through check-out terminal

The final coded touchpoint of the customer journey, proceeding through the check-out terminal, involved activities such as queuing at check-out terminals, generating barcodes, seeking help, clicking icons, selecting payment options, scanning barcodes, validating purchases, paying for groceries, and scanning a barcode to exit the store. After scanning all products, customers had to generate barcodes that could be scanned at the check-out terminal, before selecting the payment method and the amount paid by debit or credit card. That is, the products already had been scanned, so only the final barcode that contained the overall amount payable was scanned at the terminal. Customers operationalized the terminal by touching a screen and clicking through the menu.

The data produced several schemas that were part of this final touchpoint of the customer journey. Although some were lower-level schemas, five higher-level schemas emerged: *check-out queue*, *self-check-out terminal handling*, *scanning at check-out*, *payment function*, and *supermarket security control*. At the check-out terminal, customers encountered several obstacles that led to a roller coaster of emotions at the touchpoint level:

I was a little worried about the check-out process. I don't normally use self-check-out, because I'm worried to be holding people up, if I don't scan or pack my bags fast enough. It seems

a little more stressful, because you have to think of so many things: scanning, bagging, paying, etc. I was half on my phone, half on the screen of the self-checkout counter and honestly didn't really know what to do first. First pack your bags, then pay? The other way around? I'm a creature of habit when it comes to my shopping experience, so this first new experience was slightly overwhelming with all the screens involved. I again felt less present and less focused at the task at hand, so it's easy to miss things. (P3)

The particularly high cognitive involvement of the customers was enhanced by the social surroundings, in which staff members supervised the process, and other customers were present. The most negative emotions detected at this touchpoint level related to queuing and waiting for others to (self) check out; there was confusion about the lack of instructions on how to handle the self-check-out terminal. Participants reported anxiety about this touchpoint:

At first, I was confused, and also slightly anxious. Will it work the way I hoped it would? Will there be any issues along the way? This got replaced by full anxiety by the time I made it to the self-check-out counter. Again, will the process be working properly? Will I be fast enough, or just holding up everyone behind me? (P3)

At this touchpoint, the social surroundings were linked closely to the emotion of anxiety; the longer the queue at the self-check-out terminal, the more nervous the customers who were about to use it became. Another stimulus that led to confusion was a pop-up message on the screen that indicated that a staff member needed to validate a purchase:

The line was quite long but it didn't take lots of time. I clicked on "pay" and a bar code appeared on the screen. I scanned that code into the machine and a pop-up message appeared. I waited for a while but nothing happened. I tried to scan the bar code again but everything was the same as the first time. I started to feel a little bit confused and looked around to see how other people were doing. Then, a staff came to me, checked the quantity of my products and used her device to scan something on the machine. I figured out that the staff must check the right quantity of products and approve it before I can proceed to next steps. After that, I used

the bank card to check out [pay], received the receipt and scanned the receipt to open the gate. (P25)

My second interaction was with the employee at the self-scan check-out, who checked whether I scanned all of the groceries I wanted to buy. This interaction was a bit irritating, since the employee was unsure about what she had to do. First she accused me of not scanning all my products, but afterwards she noticed she made a mistake. (P31)

At this touchpoint, customers had to take active roles in fulfilling many tasks in a short period of time, and the analysis reveals a wide variety of encountered stimuli that mostly activate the senses of vision, touch, and hearing.

Stage 3-4: Schema appraisal and schema-based response

To illustrate how existing schemas are modified and how cognitive, emotional, and behavioral responses change across the customer journey, Figure 3.3 indicates ways that schemas get confirmed, assimilated, accommodated, or replaced. In line with the previous literature review, schema modification results in diverse cognitive, affective, and behavioral responses.

Activated schema: confirmation

In the exploration phase, customers naturally activate a multitude of schemas that help them understand and navigate the app. The most obvious confirmation is brand recognition, and the schema relates to the app's design, colors, and digital layout, which participants frequently mentioned:

*Clean design, easy to see that it belongs to [name of supermarket].
(P1)*

I directly associated the app with [name of supermarket], because the logo and design is really present. (P38)

The schema of *app navigation* was cited as important according to the touchpoint of exploration; customers derived information associated with this schema from information from similar apps. Although the operationalization of the supermarket app differed, customers accepted and therefore confirmed existing schemas:

It reminds me of other food ordering applications or recipe pages. The layout of the app is very typical, which makes it easy to use and understand even though it is in a different language. (P35)

Everything as expected from such an app. (P11)

In this case, comments like “very typical” and “as expected” confirm the existing schemas of both participants, showing the activation of existing schemas and the forming of cognitive, affective, and behavioral responses:

The app is well constructed comparing to standard application user interfaces. Apparently, it has additional features to the scanning function. Since I already have a bonus card [of the supermarket] I will connect it the app. The shopping list function could be useful, especially in combination with the bonus program. (P20)

That is, the customer recognizes additional features in the app interface that activate and link different schemas such as *bonus card* and *shopping list*, which the customer perceives as “useful.” Through such knowledge integration, the customer can take actions such as adding the bonus card to her or his profile data.

Activated schema: assimilation

The SST app changed several touchpoints and activities along the journey, which also required updates to existing schemas. With regard to *phone scanning* for example:

There is no “instruction” tutorial to show you which barcode to scan. The correct bar code to scan also differs between products that “naturally” have a bar code such as milk and others that don’t, such as cucumbers. (P35)

You need to weigh some veggies and fruits by yourself [in order to get the barcode]. That was not written anywhere. (P37)

Customers had to modify the schema of *barcode scanning*, using information such as the barcode that needed to be scanned to add a product to a card. They had to change their behavior, because the app required customers, rather than cashiers, to weigh particular products, produce barcodes, attach them to products, and scan them with their phones. However, this schema modification did not involve completely new

information, and there was minimal stimuli discongruity (e.g., product scanning produced a pop-up error message), so the modification did not require much cognitive effort or arousal:

I went to the milk section to buy some milk. I took the milk and scanned the code on the sign that indicates the price. Again, I received an error message, telling me that the barcode is not known. I tried several times more and then figured out that you need to scan the barcode on the product. After realizing this, I continued to buy some more. (P35)

After figuring out how the app works I liked using it. It actually saves a lot of time. (P40)

The modification of schemas in these examples led to additional information that became attached to the schema *barcode scanning* and resulted in cognitive change (e.g., identifying the correct barcode), behavioral change (e.g., weighing products to generate correct barcodes), and emotional change (e.g., first being frustrated but then enjoying the process).

Activated schema: accommodation or replacement

The process of schema accommodation or replacement is highly arousing and requires substantial cognitive effort; it results from a schema discongruity effect; whereby incoming stimuli cannot be matched with existing schemas. The most substantial changes at the touchpoint level relate to the check-out process, which provides an example of schema accommodation/replacement. The traditional check-out process required customers to queue at the cash register and place all products on the check-out belt for scanning by cashiers, before customers could pick them up, place them in their shopping carts, and pay:

Normally, I am used that an employee scans the products I buy. This always takes a long time, because you have to queue at the cashier. What I also do not like about this, is that you have to pack all your products quick, because you feel the pressure of the people waiting behind you. So, the app makes my shopping trip less time consuming and more relaxed. (P26)

In line with the pyramidal, hierarchical structure introduced by Figure 3.1, the check-out process corresponds to the event schema at the top. The

preceding comment indicates several lower-level schemas: *check-out queue*, *check-out handling*, *scanning*, and *packing*, all of which entail detailed information about activities and potential examples. The data analysis revealed several schemas at the check-out touchpoint that substantially changed the check-out script; not surprisingly, customers reported higher arousal and emotions at the check-out:

At first, I was confused, and also slightly anxious. Will it work the way I hoped it would? Will there be any issues along the way? This got replaced by full anxiety by the time I made it to the self-check-out counter. Again, will the process be working properly? Will I be fast enough, or just holding up everyone behind me? (P3)

During the entire check-out I wasn't sure I scanned everything correctly so I always felt insecure and there was no way for me to check as I didn't get a bill and there was no explanation about how to do it best. (P11)

For Participant 26, all existing schemas associated with the regular check-out process changed: Instead of putting products on the cash terminal belt and letting the cashier scan the products or weigh products such as loose fruit and vegetables, the customer now generated a summary barcode of the preceding scanning activity. The self-scanning terminal was operated autonomously by the customer and required an interaction with a machine instead of an employee. Although the social pressure of holding up other customers seemed to decrease, the arousal felt as the result of supermarket staff members observing the process and randomly checking whether customers had all items correctly scanned increased. That is,

During the self-checkout there is someone watching you. So, there is still some interaction, even though it's not verbal. (P40)

After scanning the barcode that entailed all my items, the machine just didn't proceed and a pop-up message appeared. I started to look around to see how other people were doing and suddenly a supermarket staff came to me, checking the quantity of my products and scanning something on the machine. (P31)

One participant positively perceived that the check-out process went faster than usual (P38), another appreciated the autonomy of the check-out process (P9), and yet another reported feeling less socially present (P3):

The check-out was really fast and there was an instant connection to the self-check-out machine. (P38)

Fancy, kind of cool to be your own “boss”, not relying on the cashier at the end. Saved a lot of time, because we didn’t have to wait in line. (P9).

Honestly, I didn’t interact with anyone throughout the entire experience, which I thought was a little strange. I was also so consumed with setting everything up and so focused on this app experience, that I didn’t notice much around me. I felt less present than I usually would and didn’t spend as much time looking around. (P3)

In line with Participant 3’s comment, several customers stated that they were more mostly interacting with technology, and the operationalization of the SST app required most of their attention, resulting in the perception that they focused less on their social surroundings.

Discussion and implications

The results of this study specify six distinct touchpoints at which a variety of schemas provide customers with scripts for cognitive, emotional, and behavioral responses. In line with existing research, the study shows that when customers experience new encounters that are somewhat ambiguous, the customers draw more consciously on their episodic and semantic memories to activate and combine existing schemas (Spears and Yazdanparast, 2014). For example, during the exploration phase of using a new app, visual stimuli dominate, triggering episodic and semantic memories (e.g., the scanner icon triggers the event schema of parcel shipment, the layout of the home screen connects it with other apps that make navigation easier). Matching stimuli with existing knowledge results in schema confirmation. In contrast, encountering incongruent stimuli requires updating of existing schemas with new information (Helmefalk and Berndt 2018). The study revealed that incongruent sensory information leads to schema modification at three different levels: assimilation, accommodation, and replacement. Whereas assimilation of existing schemas involves minor adjustments to existing schemas that ultimately

result in schema congruity (Mohammed *et al.*, 2000), accommodation and replacement require higher cognitive involvement, exemplified by customers' trial-and-error iterations. According to the pyramidal structure of schemas (Figure 3.1), assimilation takes place at more detailed encounter levels. For example, when customers who are accustomed to scanning products with the store's hand-held scanners switch to mobile scanning, they connect additional stimuli to their existing schema and easily update to the schema of *self-scanning*.

Accommodation and replacement take place near the top of the pyramid; entire touchpoints change as the result of the SST, and as a result, customer activities also change. Such reshaping of existing schemas constitutes high arousal and reflects stronger, more negative emotions. Customers' reports of frustration and anger often reflect their perception that information is missing from the service provider side. The SST app changes all touchpoints through trial and error and incorporates higher arousal, which is further reflected in expressions of stronger emotions.

Theoretical implications

Opening the black box of schematic information processing reveals that it underlies customer experiences along the customer journey in (new) servicescapes. The conceptual framework depicts this process of integrating sensory stimuli with four types of existing schemas that contain information about previous experiences: event schemas, touchpoint schemas, encounter schemas, and schemas about concrete examples and actions. When encountered stimuli activate sets of schemas, they are appraised according to four degrees of change: acceptance and confirmation (no change), assimilation (marginal change), accommodation (substantial change), and full replacement. This appraisal process influences three customer responses: cognitive, emotional, and behavioral.

The ESET focuses on the different stages of the conceptual framework and operationalizes the role of schemas in new, SST-enabled servicescapes. This novel mixed-method approach enables fine-grained analyses of customer experiences across the customer journey (Lipkin, 2016). In particular, the combination of in-depth interviews, participatory observations, and visual card mapping provides more accurate insights into evolving customer experiences; it highlights activated schemas across multiple touchpoints and illustrates how encounters with additional or incongruent stimuli modify existing knowledge structures. Accordingly,

this article empirically shows how the activation of various schemas guides activities and leads to diverse cognitive and emotional perceptions at the touchpoint level.

This study builds on recent calls for research that introduces new, relevant methodologies to the service research field (Lariviere and Kandampully, 2019). The results offer a holistic perspective on how increasingly digitalized servicescapes influence customer experiences (Bolton *et al.*, 2018; Marketing Science Institute, 2018) and uncover the link between schematic information processing and resulting embodied cognitive, emotional, and behavioral responses. For service researchers, these findings have several implications. The results demonstrate that investigating customer experiences requires in-depth analyses of not only encountered sensory stimuli and customer responses but also how these stimuli match customer-specific activated schemas in particular contexts and at their moments of occurrence. Methodological approaches such as ethnographic research help uncover the mechanism of schema modification and provide understanding of customer responses.

Managerial implications

The results of this empirical study yield important information for at least three major groups: service and retail managers, policy makers, and educational institutions. First, in-depth analysis of customer experiences at the touchpoint level generates rich insight into the most prominent schemas, from customers to SST innovations that interrupt existing servicescapes. These findings suggest the need to design touchpoints so that they trigger congruent stimuli to update relevant schemas, easing customers' activities along the customer journey and yielding positive cognitive and emotional responses—even in unfamiliar environments. Because customers not only value autonomy but also demand more supportive infrastructures, retailers should carefully design self-serve touchpoints to facilitate behavioral changes.

Second, by using schemas that guide customer food selection, policy makers can trigger health consciousness and establish guidelines for targeted stimuli that activate health-related schemas at the most desirable moments of the customer journey. Moreover, by understanding how schemas are activated, they can develop effective sustainability strategies that lead customers to behave in more sustainable manners.

Third, the study methodology might inspire educational institutions to incorporate novel research techniques, including ESET, into their curricula. An increasingly complex contemporary environment requires tailored methods that fit the problem at hand, not the imposition of an established method onto the problem. A tailored, mixed-method approach can teach researchers a variety of skills and provide deeper insights.

Limitations and future research

This study offers a novel approach to assessing schemas, their modifications, and subsequent customer responses across the customer journey. While the paper opens a black box in customer experience research, yet future research is needed to build on the established knowledge to fully understand the role of schemas. Therefore, the present paper should be interpreted in light of its research limitations. First, the combination of interview data with touchpoint and emotional journey mapping provides rich insights, but the time-consuming nature of this ethnographic approach limited the sample size. The results thus may be specifying to young, well-educated people who perceive themselves as technology savvy. Future research should build on this study and investigate the role of similar schemas in diverse contexts, with and across consumer groups, to enable comparison. Second, the study scope is limited to first-time exposures to an SST innovation. Behavioral changes may occur only after several completed customer journeys, so longitudinal studies over periods of several weeks might provide a more comprehensive view of schema modification across time. Finally, as an initial attempt to address the inner mechanisms of information processing, this study opens several new research avenues, as detailed with research questions in Table 3.3, designed to move the service management field forward.

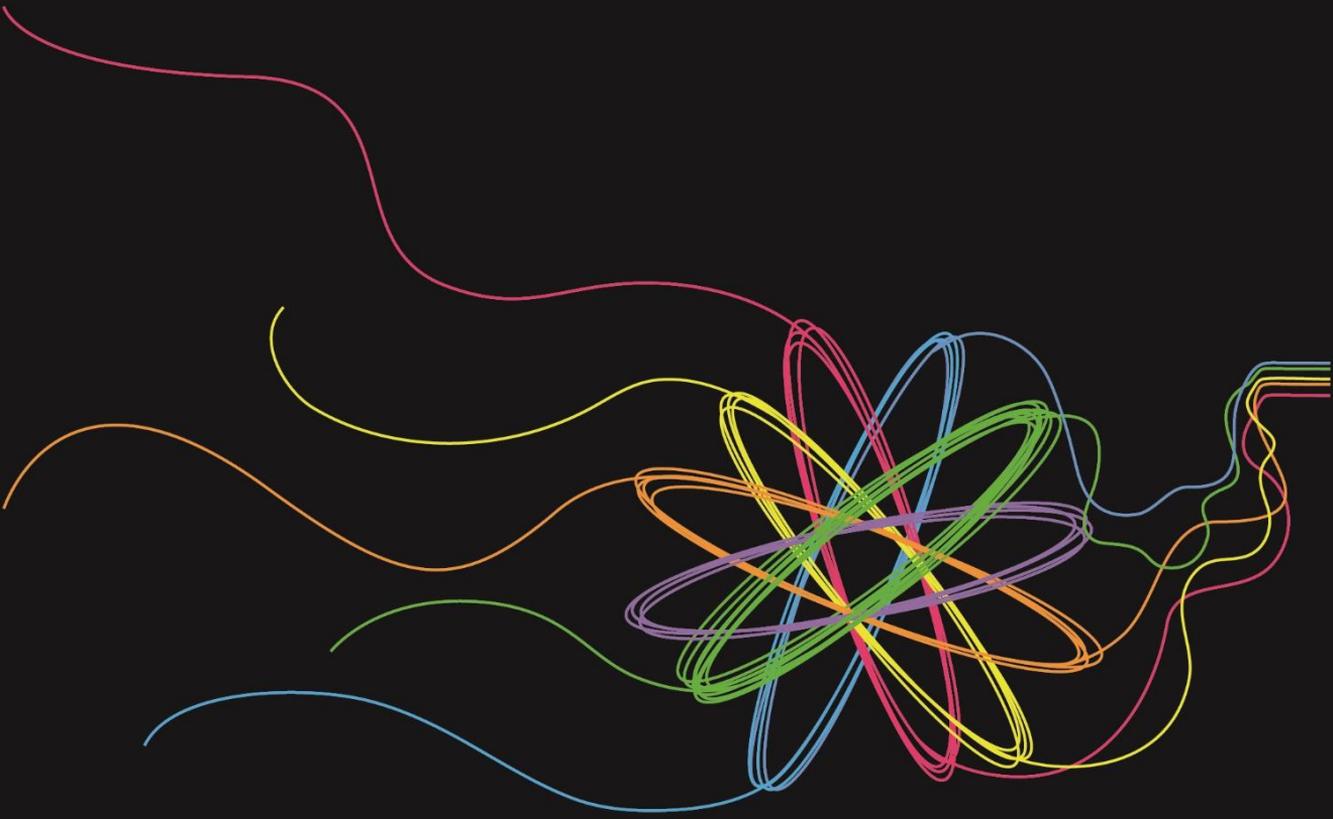
Research topics	Research questions	Suggested readings
Schema modification	How can the processes of schemas modification be eased?	Taylor and Crocker (1981);
	What role do schema breakdowns play in customer experiences?	Helmefalk and Berndet (2018);
	Under which conditions does schematic information processing hinder customer learning?	Williams (2019)
	Under which conditions is schema discongruity beneficial to customer learning	
	What is the optimal level of stimuli congruity and discongruity?	
Schemas with evolving service technology	How do schemas evolve with continuous usage of technology-enabled services?	Greve et al. (2019); Keating et al. (2018);
	Which schemas are activated and play roles in the choice between technology-driven and employee interactions?	Leo et al. (2019); Wirtz et al. (2018)
	How can the usage of technology-driven service encounters be made easier?	
	Which provider-induced stimuli are continuously perceived as congruent/incongruent with existing schemas?	
	Which encounters increasingly cause discongruity and necessitate schema accommodation?	
	How can emerging technologies such as augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) facilitate schema modification and behavioral change?	

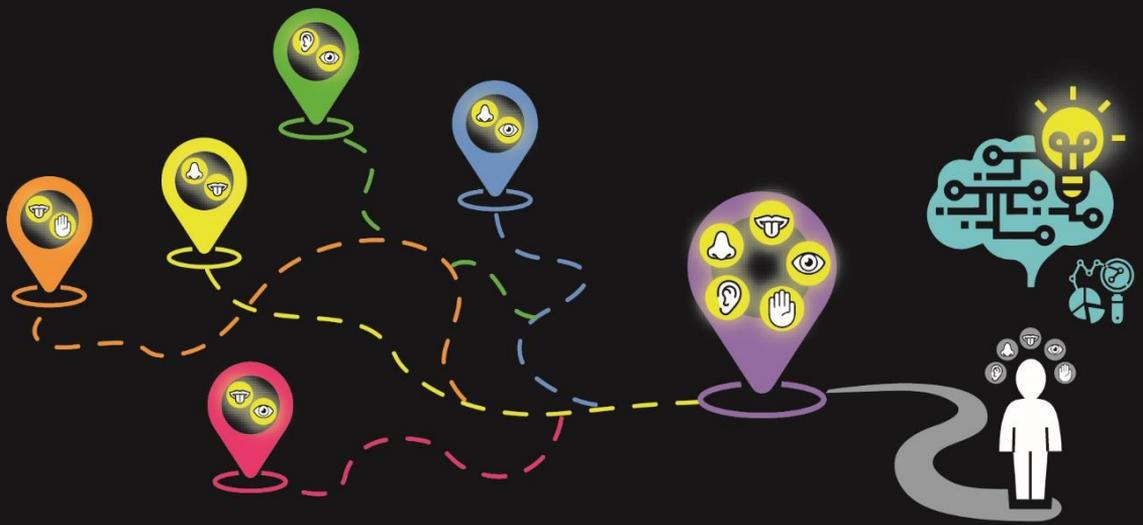
Table 3.3 Future research directions

Schemas in transformative service research	What role can schemas play in transformative service research?	Anderson et al. (2013);
	How can schemas move transformative service research forward?	Leo et al. (2019);
	How can approaches such as service design facilitate schema modification toward well-being?	Russell-Bennett et al. (2019)
	How can retailers stimulate healthy schemas across the customer journey?	
	Which schema-activation strategies guide more sustainable cognitive perception and behavior in general?	

Table 3.3 *Future research directions (continued)*

Conclusion





Conclusion

In the introduction of this dissertation, I used the example of onboard flight experiences to illustrate today's multisensory CSE battlefield; CSE is becoming the top differentiator of organizations competing in the same industry (*Forbes* 2020). The Marketing Science Institute's (2018) acknowledgement of the need to understand, manage, and design meaningful CSEs as a top research priority has led to research efforts across diverse contexts.

This dissertation focuses on four major research gaps that impede comprehensive understanding of CSE and progress in the field: (1) insights on the role of the five definitional dimensions of CSE, (2) knowledge of the sensory dimension within and beyond the service discipline, (3) overview of the role of senses in shaping CSE, and (4) understanding of sensory integration and processing of information. The objective of this dissertation is to provide a more comprehensive picture of CSE research and its five definitional dimensions—physical, social, affective, cognitive, and sensory—focusing particularly on the last (somewhat neglected) dimension. Perhaps reflecting the complexity of the sensory dimension, literature has been missing a clear understanding of its relationship to CSE. Accordingly, I present three manuscripts that together advance the theoretical and empirical nature of CSE's five dimensions, with an emphasis on the sensory dimension.

Table C1 provides an overview of the research gaps, research questions, contributions, and propositions that I derive from this dissertation.

Synopsis of manuscripts

In Manuscript 1, I systematically explore existing CSE research to describe the status quo of research published in the top service and marketing journals since the topic emerged. I conduct text mining analysis of 258 articles published between 1994 and 2018 to depict the evolution of CSE research and its shift toward the study of value and interaction. I systematically explore the themes and concepts that address the first and second research gaps (Table C.1), to develop a more complete understanding of the body of CSE research. I shed light on definitional dimensions in the service and marketing fields and reveal the shortage of studies that investigate the sensory dimension. This finding in particular

Conclusion

establishes the need for holistic analyses that go beyond the boundaries of service and marketing. Accordingly, I undertake such an analysis in Manuscript 2.

In Manuscript 2, I provide a more comprehensive review of theoretical and methodological contributions from other research disciplines. By integrating key concepts and themes across disciplines, I identify multidisciplinary research directions that can improve our understanding of multisensory CES.

In Manuscript 3, I build on the findings of the cross-disciplinary analysis in Manuscript 2; I draw on cognitive science and psychology literature to shed light on sensory integration processes, thereby addressing the third and fourth research gaps (Table C.1). I follow 42 customers across their respective customer journeys, fully emerging into the servicescape context to understand how CSEs are shaped. By building on cross-disciplinary insights, I develop a conceptual framework that integrates the role of schemas; I show that customers match stimuli in servicescapes to their existing schemas, and this matching guides their perceptions and behaviors. I test my conceptual model in an empirical context, demonstrating that schematic information processing shapes CSEs across the customer journey.

Overview of implications

Whereas each of my manuscripts makes unique contributions, their compilation provides overarching theoretical and managerial implications. I derive six important propositions from this dissertation that suggest valuable insights for theory and practice.

Proposition 1: The sensory dimension of CSE is the most influential dimension

Theoretical implications

Extant service and marketing literature shows that though all five CSE dimensions have profound impacts on overall CSE (e.g., De Keyser et al. 2015; Lemon and Verhoef 2016), the sensory dimension is the least investigated. In Manuscript 3, I reveal that the sensory dimension also is the most *influential*: Customers first encounter stimuli in servicescapes through their senses, then connect the stimuli to their existing memories.

The level of (dis)congruity of sensory stimuli with existing schemas has a profound impact on customers' cognitive and affective responses. Customers perceive the physical and the social dimensions as stimuli; their absorption of these dimensions through their senses influences their responses. For example, they connect a loud warning sound in an airplane to seeing the "fasten-seatbelt" sign. By adopting a customer-centric perspective, I suggest that customers' activated senses filter and process the stimuli they perceive as relevant, and such filtering and processing ultimately influences their perceptions and behavior. Accordingly, I advise CSE researchers to undertake subtler analyses of sensory dimensions.

Managerial relevance

In an increasingly competitive service environment, it is important that service managers take a customer-centric perspective to facilitate extraordinary CSE. The starting point of any service (re)design should be understanding which sensory stimuli frequently lead to positive or negative emotions or reactions. I advocate for service managers to focus on sensory stimuli across service encounters. For example, in the case of onboard flight experiences, they might investigate the influence of warning sounds and visual stimuli that indicate airliners are facing turbulence that requires passengers to be seated. Although such encounters are only one of many other encounters that customers face along their journeys, they are essential parts of experiences in which senses play a substantial role and yield important insights related to service optimization. I maintain that existing methodologies and approaches cannot capture CSE overall; CSE must be investigated in the field and across the entire customer journey, while customers are experiencing services. By assessing sensory information, managers can identify the obstacles and challenges that customers face and improve the design of CSEs according to a multisensory understanding.

Conclusion

Research gap	Manuscript	Research question
Insights on the role of the five definitional dimensions of CSE	1	Which theoretical concepts distinguish the five definitional dimensions of CSE?
Knowledge of the sensory dimension within and beyond the service discipline	1	To what extent is the sensorial dimension present in CSE research?
	2	How can we bring fragmented scholarly contributions together to develop an interdisciplinary perspective on sensory research?
Overview of the role of senses in shaping CSE	2	How can we create an overview that orchestrates scholarly research to understand the interplay of all senses and their influences on CSE?
	3	What is the interplay of the customer's five senses?
Understanding of sensory integration and processing of information	2	What do we know about multisensory integration?
	3	How do customers select and connect sensory information with existing knowledge?

Table C.1 Overview of research gaps, dissertation implications, and propositions

Implications	Proposition
<p>Extracts and consolidates the concepts and focal dimensions across a large set of articles in a rigorous, automated, systematic way</p> <p>Identifies important pathways to advance service research and CSE</p>	<p>Proposition 4: A multidisciplinary perspective on CSE research moves the sensory field forward.</p> <p>Proposition 6: Service research needs novel methods to elicit tacit and subconscious processes.</p>
<p>Finds the sensory dimension is the least investigated CSE dimension in service and marketing research</p> <p>Describes the status quo of sensory research within and beyond the service and marketing disciplines; provides structure to diverse fragmented and complex literature streams</p>	<p>Proposition 1: The sensory dimension of CSE is the most influential dimension.</p> <p>Proposition 4: A multidisciplinary perspective on CSE research moves the sensory field forward.</p>
<p>Employs a combination of co-citation and text mining methods, and applies them in an interdisciplinary setting to uncover research gaps for an integral domain</p> <p>Shows that sensory modalities can be activated simultaneously</p> <p>Shows multiple senses encounter stimuli simultaneously; matches these stimuli to existing experience memories (i.e., schemas) that drive responses</p>	<p>Proposition 1: The sensory dimension of CSE is the most influential dimension.</p> <p>Proposition 2: Schematic information processing is the underlying process of CSE.</p> <p>Proposition 4: A multidisciplinary perspective on CSE research moves the sensory field forward.</p> <p>Proposition 6: Service research needs novel methods to elicit tacit and subconscious processes.</p>
<p>Constructs a conceptual framework details the process of integrating and matching sensory stimuli derived from servicescapes into existing knowledge structures—an inner process that ultimately determines customers' cognitive, emotional, and behavioral responses</p>	<p>Proposition 3: Schema appraisal determines customer change.</p> <p>Proposition 4: A multidisciplinary perspective on CSE research moves the sensory field forward.</p> <p>Proposition 5: Use mixed-method approaches for complex, interwoven phenomena.</p> <p>Proposition 6: Service research needs novel methods to elicit tacit and subconscious processes.</p>

Proposition 2: Schematic information processing is the underlying process of CSE

Theoretical implications

In Manuscript 2, I take a multidisciplinary perspective on the sensory dimension to show that service and marketing research lacks a clear understanding of how internal processes are integrated with sensory stimuli and transformed into customer responses (Scott and Uncles 2018). In Manuscript 3, I leverage the concept of schemas to open the “black box” of customers’ inner processing. I develop a novel framework that defines schematic information processing as the underlying process that shapes CSE. I describe four stages in which sensory stimuli are (1) encountered, (2) matched with existing schemas, (3) assessed, and (4) used to derive cognitive, emotional, or behavioral responses. This process is critical, because the evoked set of schemas constitutes a customer’s personal “database” of existing, memorized experiences. For example, in the case of the onboard flight experience, noticing a loud warning sound activates schemas connected to memories of train platform experiences, in which announcements usually follow loud warning sounds. These memories trigger attention to other auditory cues, such as associating a sound on the airplane with the “fasten-seatbelt” sign. Understanding the process between encountered stimuli and the activation and assessment of schemas reveals far more information than outcome measures alone.

Managerial relevance

For service providers, it is particularly important to understand and act on the most dominant sensory stimuli and the schemas they activate. For example, if a passenger on a flight expresses anxiety because of being unable to localize the loud warning sound, the passenger might have existing memories that cause this anxiety. Similarly, if many passengers report they were unable to localize the sound, the airline should act to improve its service, by combining the sound with additional stimuli, such as follow-up announcements or more prominent visuals. To act upon such situations, in which customers report negative emotions or reactions, service providers should carefully assess the service encounters. When customers repeatedly report they are receiving sensory information that leads to confusing or negative associations, service managers can use those reports to guide the redesign of corresponding touchpoints.

Proposition 3: Schema appraisal determines customer change*Theoretical implications*

In this dissertation, I address previous calls for research that highlights the importance of investigating CSE from encounter-specific and dynamic perspectives (e.g., Scott and Uncles 2018; Zaki 2019). Schematic information processing not only reveals the relative performance of current service offerings according to customers' perceptions but also provides the grounds for systematically guiding and changing customer behavior. In Manuscript 3, I demonstrate the role of sensory stimuli in helping customers understand and navigate unfamiliar environments. I also find empirical support for the notion that inadequate matching of sensory information with existing schemas results in schema modification through accommodation or replacement and leads to cognitive or behavioral change. I propose that any research that focuses on innovation adoption or resistance should take a customer-centric perspective; it should investigate the corresponding schematic information processing by the prospects. My clarification of which schemas lead to innovation resistance or innovation adoption allows for post-delivery assessments of the correctness and/or completeness of sensory stimuli.

Managerial relevance

The insights generated by my schematic information processing model can have profound impacts on the design and delivery of services. I suggest that service managers use my approach to assess their existing services and apply it to pilot versions of service innovations. Among the important insights to be gained from my model are essential knowledge about the functioning, effectiveness, and cognitive effort that a service requires from customers. For example, changing the flight check-in process from the traditional offline mode of customer-employee interaction at a service desk to a completely automated, employee-free process requires customers to significantly change their behavior. By knowing which parts of the process customers are most likely to struggle with—and particularly, which stimuli are missing or misleading—managers can optimize service transitions before they are officially launched and minimize the risk that customer frustration will “go viral.”

Proposition 4: A multidisciplinary perspective on CSE research moves the sensory field forward

Theoretical implications

My research shows that interest in CSE and sensory research crosses disciplinary boundaries; therefore, it is necessary to recognize research that goes beyond the concepts and theories (Manuscripts 1 and 2) of the service and marketing fields. Because the disciplines of neuroscience, cognitive science, and psychology all have contributed valuable insights on the role of the sensory dimension of CSE (Manuscript 3), it would be a missed opportunity not to benefit from these valuable insights. Research efforts that remain in silos risk “reinventing the wheel” (Chesbrough and Spohrer 2006), because they lack broader perspectives on their topics. Both the advantage and disadvantage of crucial, fast-evolving topics is that they fragment into diverse avenues; existing research can be difficult to understand comprehensively, but the three-stage, mixed-method approach that I use in Manuscript 2 provides the benefit of drawing on other disciplines’ established knowledge to move the focal topic and sensory research field forward.

Managerial relevance

An important lesson that can be derived from my dissertation is that both researchers and practitioners should engage in multidisciplinary efforts. In this dissertation, I seek to fill important knowledge gaps in research and practice that impede the development of a sophisticated strategy to move CSE research and multisensory CSE design forward. In this context, I advise not only that academics should conduct multidisciplinary research to overcome discipline silos (Martins et al. 2012) but also that service managers should deliberately set up multidisciplinary teams. By involving customers, managers can gain a more customer-centric perspective (Manuscript 3) that improves their existing services; moreover, by involving practitioners from other disciplines, they can obtain great insights. For example, an airline could employ sleep analysts to provide passengers with meditation media to ease sleep or to improve the design of passenger seats, creating rich, multisensory CSEs that engage all senses.

Proposition 5: Use mixed-method approaches for complex, interwoven phenomena*Theoretical implications*

Although it may seem paradoxical, a “zoomed out” view of complex phenomena can support the rearrangement needed to move research forward. Especially in the case of rapidly evolving research areas such as CSE and sensory research, describing the status quo of existing research can identify an essential turning point that significantly moves fields forward (Manuscript 2). More traditional literature reviews often are bound by sample restrictions that reflect researchers’ capacity to collect, read, and code all relevant articles (Manuscript 1); such reviews also may introduce researcher bias in the manual collection and analysis stage (Podsakoff et al. 2005). The mixed-method approach of text mining and co-citation that I employ in Manuscript 2 not only overcomes these limitations but also offers a comprehensive perspective on CSE and sensory research. This perspective enables me to identify important research gaps and new theories and methodologies that move the field forward.

Managerial relevance

From a service management perspective, my dissertation shows that the existing CES research tool kit should be extended by adding methodologies and approaches of other fields. According to my findings, I suggest that customer journeys and emotional maps should be extended and improved by incorporating dimensions that capture stimuli and schema and match them with the service encounters along the customer journey. Such incorporation would not only complete the CSE picture but also would expose problematic touchpoints and misleading stimuli that activate the schemas that lead to negative emotions and unanticipated behaviors. For example, this analysis could reveal that passengers increasingly are reporting that the smell of the air freshener used in the oxygenation of flights elicits the schema of hospital disinfectant used to avoid contagion—an association that does not lead to positive emotions.

Proposition 6: Service research needs novel methods to elicit tacit and subconscious processes

Theoretical implications

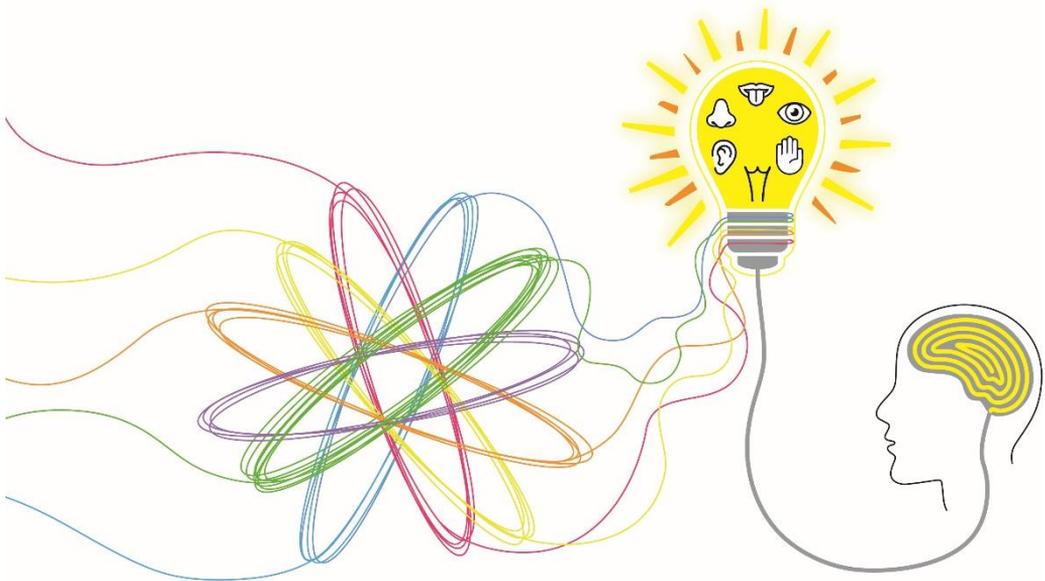
A major reason for the lack of research on the sensory dimension is that methodologies and approaches that fit such complex phenomena have been missing (Scott and Uncles 2018). Investigation of all five dimensions of CSE requires not only studying the longitudinal journey (Lemon and Verhoef 2016) but also taking a deeper perspective to elicit tacit and subconscious information. This dissertation highlights the need for novel research methods that horizontally and vertically expand existing service and marketing methods. In Manuscript 2, I describe a mixed-method approach that allows for the systematic investigation, comparison, and learning from diverse research areas to obtain a vertical overview of the phenomenon. Then in Manuscript 3, I develop the ESET, a multi-method, four-stage approach that provides a detailed view of the phenomenon. By taking a customer-centric perspective in Manuscript 3, I follow customers along their customer journeys and co-participate in touchpoint and emotional-journey mapping activities. From in-depth interviews, I derive rich, qualitative narratives that more traditional research methods cannot capture (Åkesson et al. 2014).

Managerial relevance

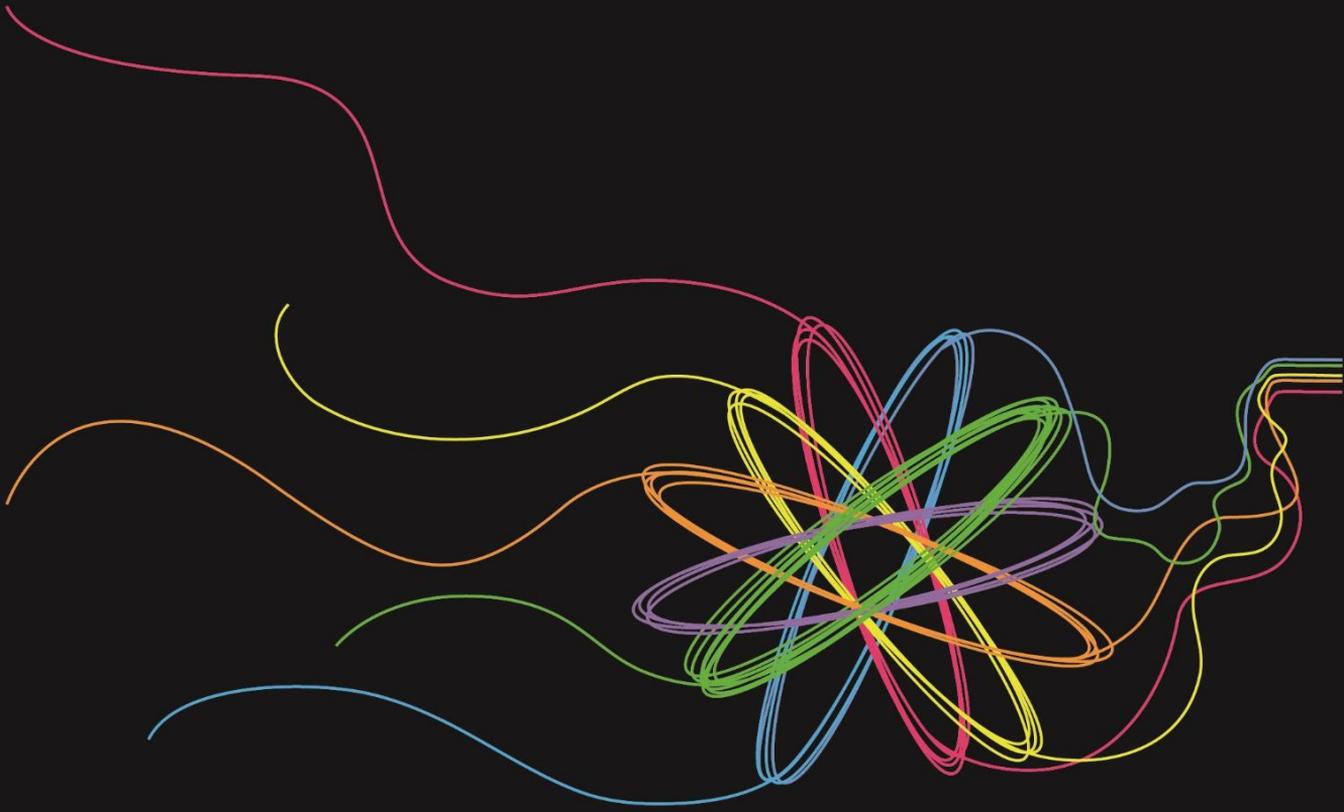
The ESET approach that I develop in Manuscript 3 can be used by service managers across diverse industries. It offers several benefits. First, because it forces organizations to take a customer-centric perspective, it helps them better understand customer feedback. Second, by following customers along their journeys, service providers can experience how the touchpoints and encounters of their service offerings perform from the customer's point of view. Third, by conducting in-depth interviews and observations, managers can gain insights that customers would not be able to recall in retrospect (Spears and Yazdanparast 2014); they can generate more in-depth information about the ways in which particular touchpoints can be redesigned to facilitate multisensory stimuli that drive favorable associations, emotions, and behavior.

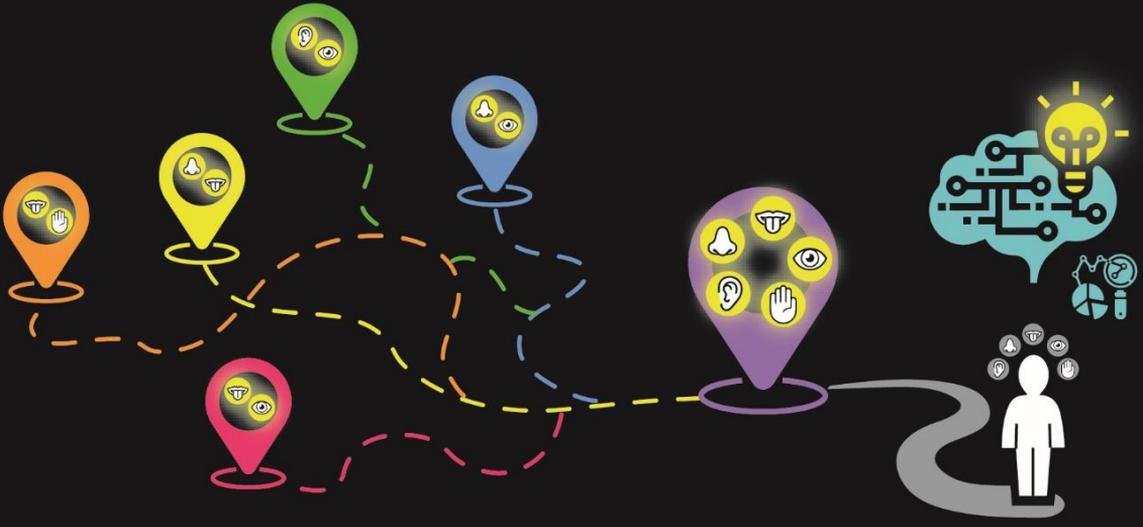
Final thoughts

This dissertation addresses a cross-disciplinarily interwoven and important topic of multisensory CSE. In my dissertation, I employ a mixed-method approach to unravel the conceptual and theoretical nature of CSE and shed light on the, in service research least explored, sensory dimension. Introducing the concept of schemas, I show how multisensory schematic information processing shapes CSE across the customer journey, and drives customers' cognitive, emotional and behavioral responses. My findings suggest that a multisensory understanding of CSE can lead to insights that enable service providers of profit and non-profit organizations to design meaningful service innovations.



Appendix





Manuscript 3: Interview protocol

The in-depth interviews featured two parts. Before the actual interview began, participants provided informed consent and answered some demographic and control questions.

Step 1: The first part of the interview consisted of the questions in Blocks 1 and 2, presented immediately after the participant had downloaded, opened, and explored the app, but before actually shopping. These interviews ranged from 15 to 30 minutes.

Block 1

1. After you opened the application, what is the first thing that comes to your mind?
2. Do you have any associations to previous experiences that come to your mind? Did the app remind you of something that you have used before? In what way?
3. After you have now opened the app and had a first look at it, what are your thoughts? Are there any things that you anticipate might happen?

Block 2

4. What are in general things you like about shopping in the supermarket? Why?
5. How long does an average shopping trip in a grocery store take you?
6. What usually takes the longest during your shopping trip?
7. What are things that you like/dislike while grocery shopping? Why?

Steps 2-3: The second part of the interview was conducted immediately after the customer finished shopping. The results of the in-depth interview were compared with the field notes and observations from the participatory researcher. Any ambiguities were discussed with the participant, to ensure the accuracy of the data. The second part lasted from 15 to 30 minutes.

Block 3

8. What did you first do when you opened the application in the store? Please explain very detailed the steps that you took. What did you click, what did you notice?
9. What came to your mind when you scrolled through the app? In other words, what associations did you have? Did it remind you of something? Did any questions emerge?
10. Besides your potential shopping company, did you notice other people in the store and around you? Please describe what you noticed.
11. Was there any interaction with other people (including staff or other shoppers)? If yes, what was each of the interactions about?
12. Please explain how the check-out went? Please explain detailed the steps that you took.
13. Did the app make your shopping experience in any form different to the shopping experiences that you previously had? Please explain why and how?
14. Were there any hurdles/obstacles you encountered when using the app? If so, what hurdles did you encounter?

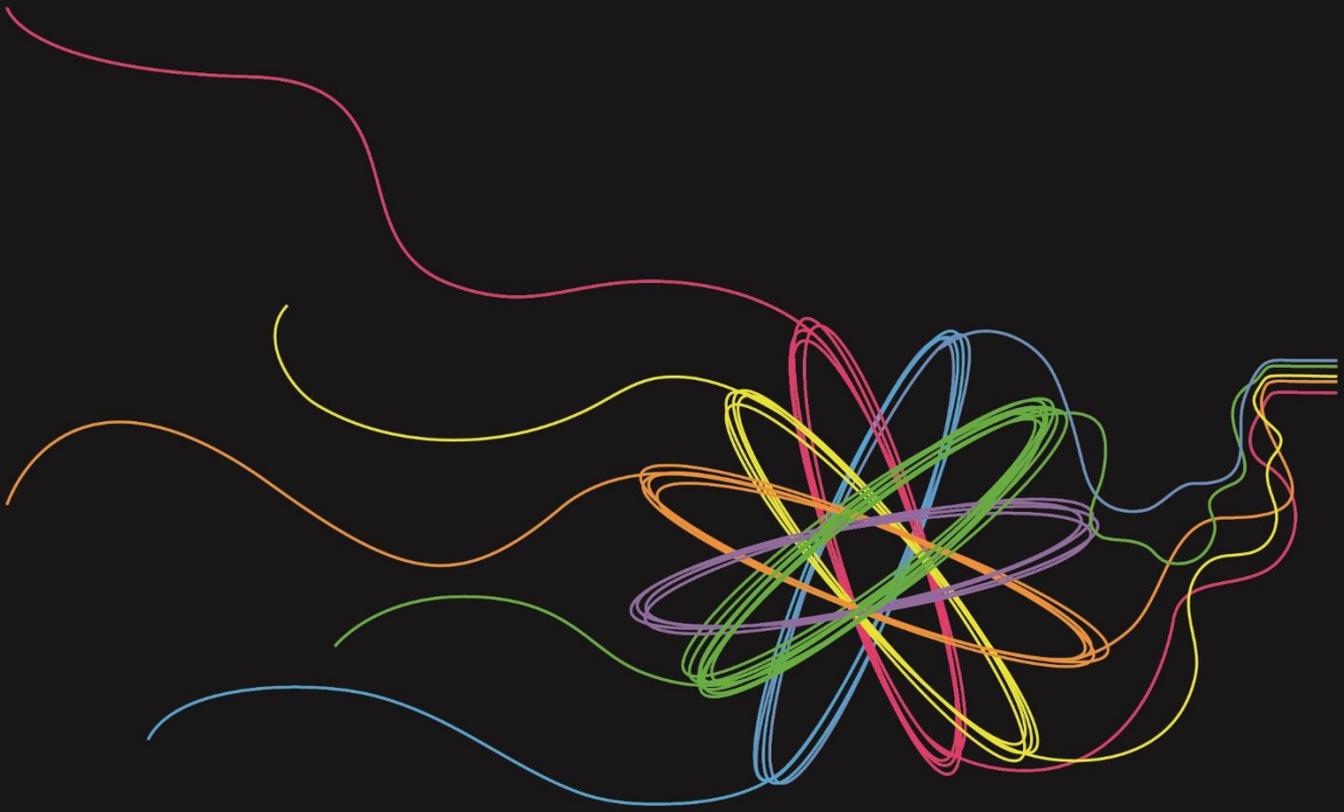
Block 4

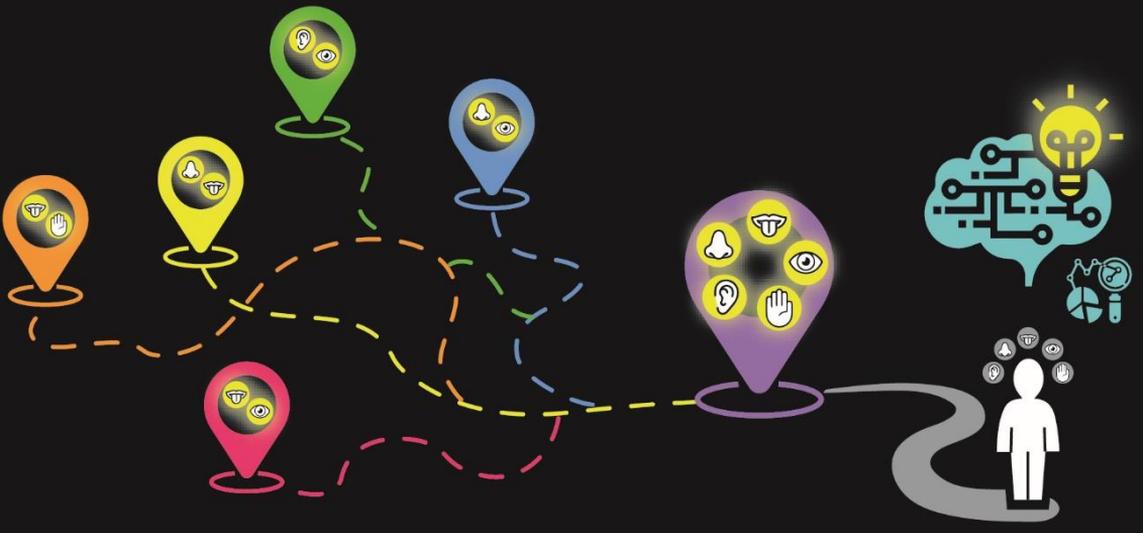
15. Do you think the app has changed or potentially replaced any touchpoints, and if so which ones and in what way?
16. How did using the app make you feel? Did your feelings somehow change at different points of your shopping journey?
17. Do you think that this app can potentially replace supermarket staff (human interaction) completely in the future? Why or why not?

18. What is your feeling towards this?
19. Do you think the app is more relevant for a particular group of people? If so, for what type of people?
20. Any other thoughts/comments you would like to share?

Steps 4-5: After the final interview question, the researcher asked participants to map their customer journey, using a card deck from AT-ONE (Clatworthy, 2010) and black cards to draw and describe touchpoints that were not part of the deck or did not match their perceptions. Next, the researcher asked respondents to use AT-ONE's emotional cards to map their emotional journeys, below their customer journeys. They then discussed each of the touchpoints and emotions with the researcher.

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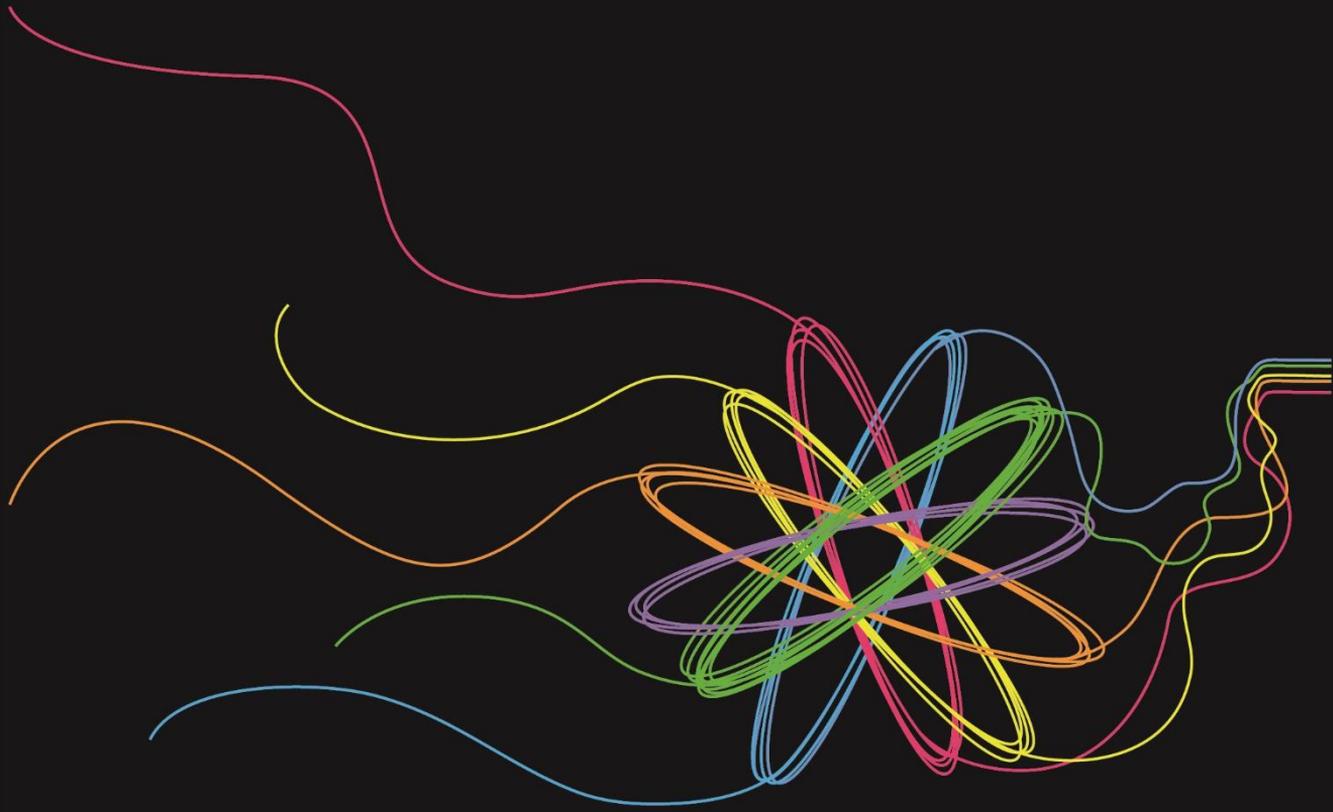
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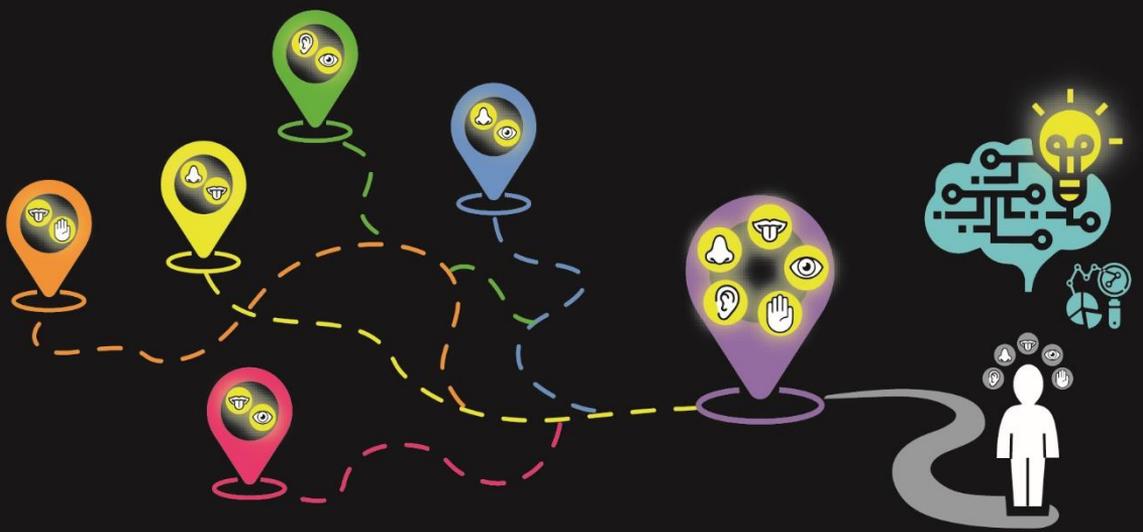
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Valorization





Valorization Addendum

The research conducted in this dissertation can be disseminated beyond academic borders. In line with Article 22, Appendix 4 of the Regulation Governing the Attainment of Doctoral Degrees the “process of creating value from knowledge, by making knowledge suitable and/or available for social (and/or economic) use and by making knowledge suitable for translation into competitive products, services, processes and new commercial activities” (National Valorization Committee 2011, p. 8). In this valorization addendum, I first outline how I have disseminated knowledge throughout my PhD trajectory, and second, explain how the findings of this dissertation can benefit a larger audience beyond academia.

Knowledge valorization during the PhD trajectory

Throughout my PhD trajectory, acquiring, generating and disseminating knowledge constituted an iterative process that guided my research. As an external associate early-stage researcher, I was fortunate to follow several workshops and courses of the Service Design for Innovation Network (SDIN), a Marie Curie training network funded by European Union’s Horizon 2020 Research and Innovation Program. SDIN consisted of an interdisciplinary research community that was formed by several European universities. Multiple academic and non-academic workshops and trainings were hosted across SDINs member universities, which together strengthened my understanding of service design as an approach and mindset to innovate and develop customer-centric services, that result in extraordinary customer experiences. The academic courses provided me with the theoretical and foundational knowledge that constitute service design, whereas the workshops and conferences facilitated a more practice-oriented application of different methods and tools. Given the customer-centric perspective that service design takes, understanding and facilitating superior customer experience is an essential element in service design research and practice.

Valorization

Throughout my PhD trajectory, I attended several international conferences, where I presented my research to academic and non-academic audiences. Exchanging state-of-the-art research and discussing industry relevant topics with an interdisciplinary audience of conference participants, was an essential part of attending these events and disseminating knowledge. In Table V.1 and V.2, I provide an exemplary overview of the events I participated in.

Academic event	Role / function
Let's Talk About Service, 2015 Namur/ 2016 Antwerp / 2018 Ghent	Workshop including interdisciplinary teamwork on industry project and collaborative research projects
Frontiers in Service Conference, 2017 New York / 2018 Austin /2019 Singapore	Research presentation and Q&A
QUIS15 2017 Porto	Research presentation and Q&A
LaLonde Service Conference, 2017 LaLonde les Maures	Research presentation and Q&A
ServDes conference, 2016 Copenhagen	Workshop on Design Thinking

Table V.1 Overview of academic events

Practitioner-oriented event	Role / function
Service Design workshop, 2016 Politecnico di Milano, Milan	Interdisciplinary teamwork and practicing of service design tools
Service Design workshop, 2016 Köln International School of Design, Cologne	Interdisciplinary teamwork and dissemination of knowledge to practitioners
Ethnographic research course, 2017 University of ESSEX Colchester, Colchester	Learning theory and practice of ethnography and ethnographic research in a multidisciplinary group of early stage researchers
Service Science Factory (SSF) workshop for a regional project of LIOF called LimburgMakers, 2017 SSF, Maastricht	Coaching and guiding a series of workshop activities with managers from diverse industries
Show Case Article / Blog Post 2018 for UMIO “Why senses are clue to designing the perfect customer experiences” Find article here: https://www.umio.nl/2018/03/02/why-senses-are-clue-to-designing-the-perfect-customer-experience/	Interview for UMIO, the executive branch of Maastricht University to disseminate research insights for practitioners operating in the field

Table V.2 Overview of practitioner-oriented events

Valorization addendum per manuscript

While the conclusion of my dissertation highlights mostly research implications, this dissertation is additionally of value and relevance to a diverse group of stakeholders beyond academia. In this addendum, I discuss how the findings of this dissertation can help service managers translate this knowledge to value propositions for a broader audience. While especially manuscript 1 and 2 are concerned with the theoretical developments of CSE and its foundational dimensions, there are yet important implications for practitioners, too. Since my three manuscripts build on each other, especially the in-depth analysis of CSE in manuscript 3 yields important implications for service providers and managers, policy makers and society at large.

Manuscript 1 Making sense of customer service experiences: a text mining review

Manuscript 1 provides the status quo on customer service experience research and establishes a more comprehensive picture of the phenomenon and its five foundational dimensions: physical, social, cognitive, affective, and sensory. The findings of the study show a shift in CSE focus from a product and brand to a value and interaction perspective. These findings suggest that research and development (R&D) of service providers have to move beyond product development and branding, to the design of valuable service environments and interactions across the customer journey. This means that service providers should thoroughly analyze customer journeys, and how each of the touchpoints can be optimized in order to improve customer experiences. This is particularly important, given a recent research that shows how customers choose one service provider over another on basis of the experience (Gartner 2020). Customer journey mapping, service blueprints, or system maps offer useful tools to map existing services and touchpoints. For example, system maps generate an overview of all actors and their activities involved in the service delivery. Involving different actors in the mapping activity can spark new ideas and solve delivery issues from a strategic and operational point of view.

Furthermore, R&D should take a customer-centric perspective to understand the customer journey and the role of each touchpoint for CSE. This means that the involvement of customers in analyzing existing services is of profound importance. The insights of this manuscript show

that the influence of the five dimensions of CSE are highly personal, and therefore, an in-depth assessment of current service delivery and the CSE it creates should regularly take place in collaboration with existing customers. Furthermore, testing service innovations, through experience prototyping can generate meaningful insights before a new service innovation is launched. From a strategic point of view, testing service concepts in an early stage and through a customer feedback loop to prevent innovation failure a later, and costlier stage.

Additional tools that help to identify potential bottlenecks in the service offering are for example, customer empathy maps and issue cards offer great means to take a deeper dive into customer perceptions. For example, the empathy map highlights customers' responses, feelings, thoughts and activities and therefore not only provides insights on the customer, but also elicits potential inconsistencies in the provider vs. customer perceptions. To further explore these inconsistencies, issue cards can foster a conversation that crystallizes customer needs, for example at a touchpoint level. On the basis of these findings service providers can better tailor their services to customers and design richer touchpoints that move beyond the core offering, which could enable them to set apart from competition. Because focusing on customers' needs and optimizing bottlenecks can in turn maximize CSE at any physical or non-physical interaction across the customer journey.

In manuscript 1, I also highlight the importance of the sensory dimension of CSE. Human senses facilitate the interpretation of information that is absorbed from the service environment (i.e. servicescape), and which guides perceptions and responses. Understanding the influence of sensory stimuli for CSE, allows service providers to create multisensory rich customer journeys, where the interplay of different stimuli can ease the cognitive effort that customers require for their activities along the customer journey. For example, a sound stimulus that raises the customer attention, is followed by a visual stimulus that illustrates the activity the customer should take. Such as the sound and speaker announcement in a supermarket that informs customers that a new check-out register is opened, is followed by a blinking green light above the check-out register, where customers can then line up and place their items on the check-out register belt.

Given the prominent role of senses in shaping CSE, I suggest that service providers pay particular attention to designing meaningful stimuli across

the customer journey. While the majority of stimuli are beyond the service providers' control, inducing congruent and relevant stimuli across the customer journey can create richer experiences. In order to identify at which touchpoints customers increasingly struggle or would benefit from additional or distinct sensory information, I suggest several in-depth interviews and walk-along diaries conducted by customers. Customers could for example use their mobile phones to immediately record and capture their thoughts while going through the customer journey.

Manuscript 2 Toward multisensory customer service experiences: a cross-disciplinary bibliometric review and future directions

In manuscript 2, I take a broader perspective on the sensory dimension and show how different disciplines contribute to a more comprehensive understanding of multisensory integration. While extant literature explored the effect of environmental stimuli on individual senses, such as atmospherics in retail stores and also increasingly in online settings, often referred to as e-tailing, surprisingly little is known about the interplay and activation of all senses and their effects on perceptual and behavioral outcomes. These insights would not only allow retailers to design sensory rich and meaningful stimuli across their service encounters, they would also benefit customers, such that they can select to the customer relevant stimuli that help them complete activities and, therefore, enhance CSEs along the customer journey.

In this study I demonstrate how neuroscience and cognitive science can provide important insights on sensory processing and multisensory integration. The insights of the study show that customers simultaneously activate different sensory modalities (e.g. touch and vision modality) and link sensory information to already existing memories. Therefore, the comprehension of all senses is important, because it is the sum of multiple sensory stimuli that activates existing memories and guides perceptions and behavior. For example, if we anticipate paying contactless with a card in the store, we first look for a sign at the check-out terminal, while holding the card in front of the scanner, we wait for a sound and the instructions that we can remove our card. While this process is different in many stores, we can still compare the process to our existing memories that are somewhat related to this process. However, if we would miss particular cues, such as the sound and confirmation that our card was scanned and the transaction is being processed, we would likely get nervous and more

prominently seek help with process. The more difficult it is for us to solve this situation; the more frustration evolves. Understanding this process is therefore very important, because sensory perception is closely linked to cognitive and emotional responses.

If, for example, a service provider wants to change customer behavior, such as switching from cash to contactless card or phone payments, sensory information processing is an elementary component that should drive the (re-)design. Based on my study insights, I suggest that service providers investigate CSEs while they occur rather than retrospectively. In fact, understanding which stimuli customers select and how they link them to their existing memories, delivers the explanation for their retrospective reactions. This means that customer behavior or the expression of their emotions is the outcome of interpreting sensory information from the service environment. Manuscript 3 yields more specific insights into the underlying process and how service providers can investigate these subtle elements of CSE.

Manuscript 3 Unraveling customer experiences in new servicescapes: an ethnographic schema elicitation technique (ESET)

In manuscript 3 I conduct a more fine-grained investigation of multisensory integration and its role in shaping CSE across the customer journey. I introduce schematic information processing as the fundamental base that shapes CSE. In the empirical study of manuscript 3, I disentangle the effect that leads from sensory stimulation through the connection to existing schemas in form of experience memories, to customers' cognitive, emotional or behavioral responses. In particular, I show how the assessment and modification of existing schemas guides customer behavior. The findings of this empirical study offer important implications for service providers, public institutions, policy makers and society at large.

First, recognizing the role of schemas in shaping CSE, shows that service providers and other institutions, such as policy makers, who are interested in understanding why customers think and act the way they do, need to explore which sensory information customers filter and connect with existing memories. This is because filtering of sensory information determines the activation of experiences, both positive or negative. For example, if customers increasingly report the smell of cleaning detergent in a supermarket reminds them of hospitals, this might not be the ideal

sensory stimuli for this environment. Service providers can easily act upon this and either change the smell of the detergent or enhance other smells that are connected to more positive memories. Techniques that can help unravel the selection of sensory information constitutes are customer diaries in form of mobile ethnography, that helps customers share immediate notes, photographs or audio recordings at the momentum of occurrence. Additionally, eye-tracking can be beneficial to better understand visual stimuli and their relation to the other senses. In particular public institutions such as municipalities, hospitals or even universities design their services a large and diverse group. A large variety of services in each of these institutions is part of the ecosystem and a smooth delivery is essential to function for the system at large. Tools such as stakeholder and ecosystem maps help uncover different actors' roles and needs and can also lead to detecting valuable opportunities and synergies.

Second, the findings of this study suggest that past experiences are at least as important as customers' current experiences. They not only serve as a reference point, they also help customers navigate and act in unfamiliar environments. Thus, understanding which experiences are activated can reveal important information for service providers. Useful tools that can be used are diary studies, in form of shared narratives. These can either take place as think aloud protocols, in which the customer verbally expresses all thoughts, or narratives and memos that are conducted by the customer, the researcher or both in form of participatory observations. Investigating at which touchpoints customers have problems connecting sensory information to existing schemas, and which reoccurring schemas lead to negative emotions or reactions, provides valuable insights on where and how to improve service offerings. For example, if customers repeatedly seek assistance at self-service-check-out terminals in a supermarket, service providers can, for example, optimize sensory information through additional visual and auditory stimuli that ease the process of self-check-out.

Third, insights on commonly activated schemas and subsequent behavior, can also have a profound impact on regulations of governments and policy makers. Think, for example, about the current state of emergency given the coronavirus (covid-19) pandemic outbreak. Covid-19, within a few weeks, changed human life profoundly. While the government seeks to prevent the spread of the disease, and therefore, attempts to regulate and change human behavior, recent developments have shown that these changes are very difficult to implement and obey. Supermarkets try to remind

customers with different sensory stimuli (e.g., signs at the entrance, markers at the floor and announcements) to act socially responsible, by taking social distance of at least 1,5 meters, avoid panic purchases that imply hoarding of products, and encourage customers to pay their groceries contactless, instead of using cash. An observation of shopping behavior has shown that customers initially did not follow these instructions, and therefore, let stores to take more extreme measures that should remind customers that we are still facing exceptional circumstances that require following these measures.

An investigation using, for example ESET the methodology that I used in manuscript 3, could benefit understanding which stimuli (e.g. lines at the floor indicating distances to the next shopper or information signs at the entrance of the store) are encountered by customers and which schemas are as a result activated. ESET follows a four-stage approach that consists of in-depth interviews, participatory observations, customer journey mapping, and emotional journey mapping activities. Using ESET, first some in-depth interviews with customer's can already clarify misunderstandings between provider and customer. In addition, following several customers along their customer journey can further reveal subtler elements. Participatory observations and emotional journey mapping activities can elicit challenges and obstacles that customers face. These insights can in turn be used to ease the habitual change process for customers.

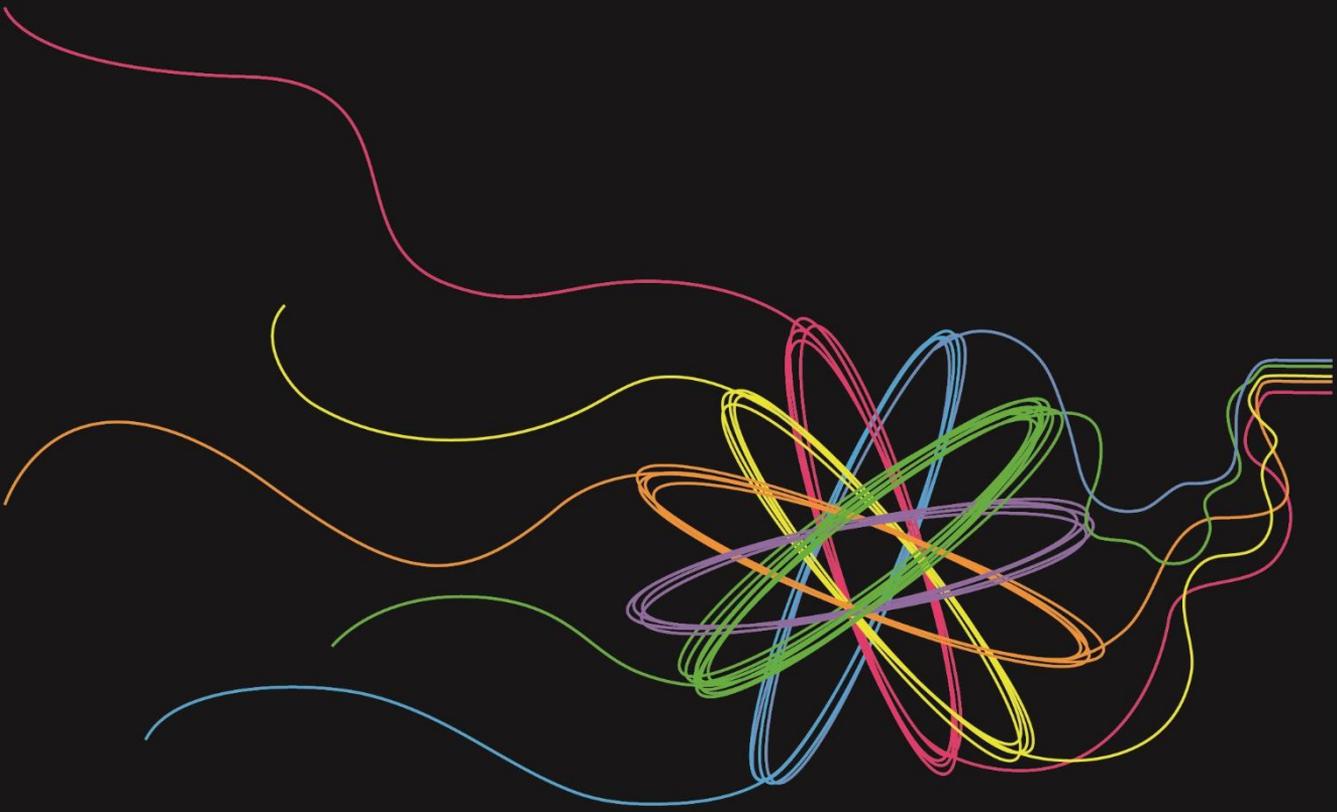
The difficulty to change human behavior is due to the difficulty of accommodating or even temporarily replacing our existing schemas. For example, to not shake hands with people that we know or to avoid touching fruit and other products to check their stage of maturity, without buying them. Furthermore, governmental institutions should be aware that regulations, which demand customers to dramatically change their behavior, also result in more extreme emotions, such as anxiety or anger. Understanding the cause of these emotions at particular journey touchpoints, could already allow with simple measures to ease these pain points, and therefore lead to a more sustainable and socially desirable behavior. The combination of customer journey and emotional journey mapping activities can generate meaningful insights in this matter.

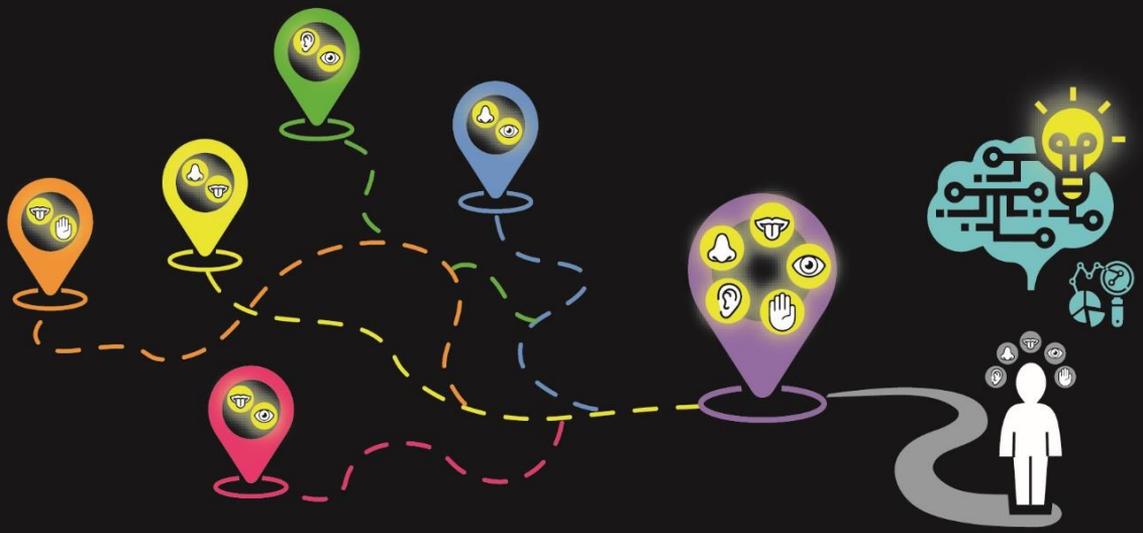
From a methodological point of view, manuscript 3 shows that increasingly complex phenomena such as multisensory CSE, also require a combination of methods that allow a more fine-grained analysis to elicit tacit experiences and knowledge stored in memory. The multi-method approach

that I developed in manuscript 3, not only benefits service providers, it can also be used for different purposes as the example above illustrates. From a customer perspective, even complex and longitudinal experiences can be revealed in their rich details. ESET also enables customers to reflect on perceptions and behavior. This can be particularly helpful under circumstances where customers anticipate changing their existing behavior. For example, reducing compulsive buying behavior in grocery stores.

In sum, understanding the role of senses and unraveling the process of multisensory integration can have a profound impact on CSE, which likewise benefits the service provider and customer. Designing and managing multisensory rich and meaningful CSEs, can therefore provide a unique weapon in today's CSE battlefields.

Summary





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Academics and practitioners coincide that customer service experiences (CSE) are today the number one differentiator for service providers. This new battlefield in which service providers seek to innovate with the goal to create extraordinary CSE, has similarly led to increased research attention across diverse disciplines. The complexity of the construct and scholars' efforts from multiple research fields, resulted in a fragmented body of literature that conceals gaining a comprehensive picture of CSE. Across three manuscripts, this dissertation investigates CSE and its five definitional dimensions: physical, social, cognitive, affective and sensory, with a particular focus on the largely neglected, latter dimension.

Manuscript 1 provides a status quo of CSE research for its core service and marketing field. The results of a systematic literature review depict the evolution of CSE research and shift in research foci from a strong provider perspective that largely investigates the role of products and brands, towards a value and interaction perspective, where increasingly a multi-actor perspective emerges. Besides this emerging holistic perspective on CSE, the results show important knowledge and research gaps, particularly for the sensory dimension. The findings highlight the need to look beyond disciplinary boundaries to be able to move the research field forward and gain a holistic understanding of multisensory CSE.

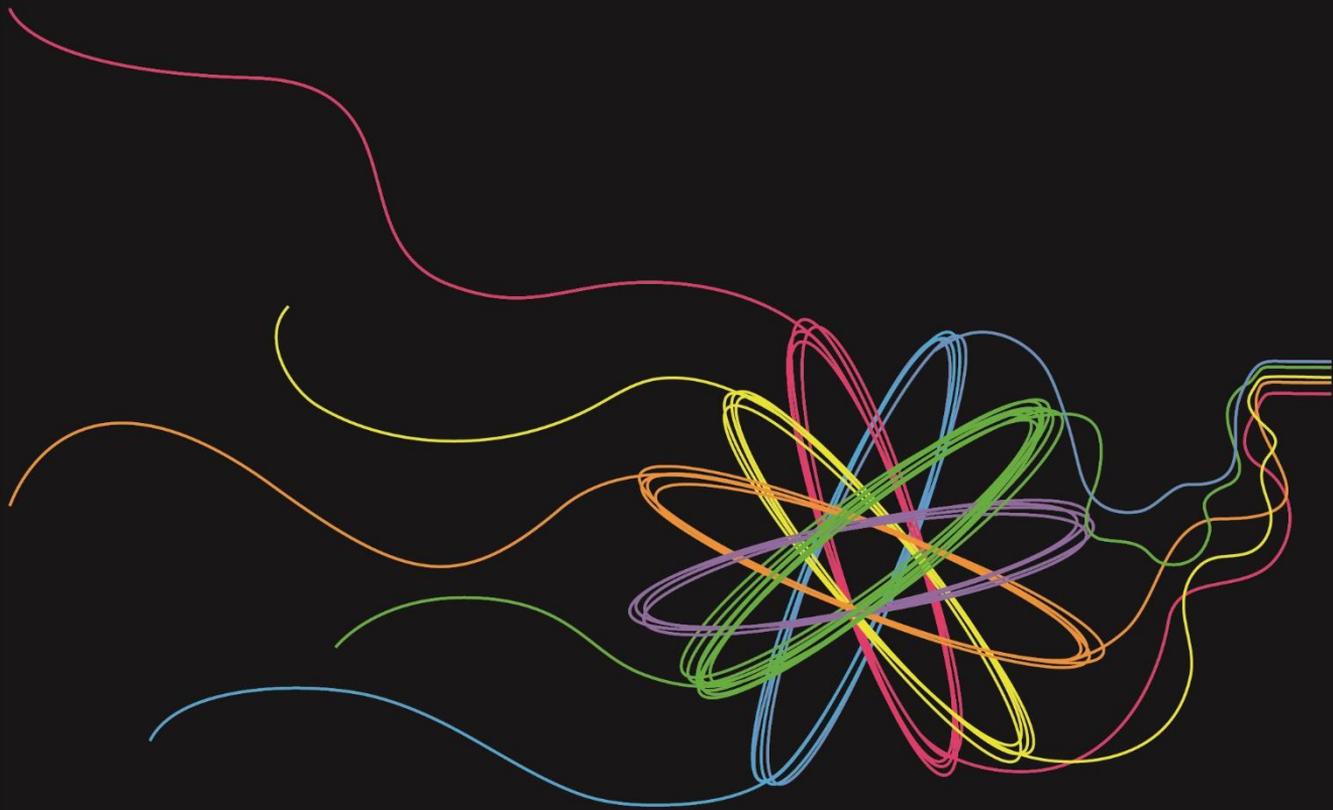
Since especially the sensory dimension of CSE remains a black box in contemporary service and marketing literature, manuscript 2 takes a much broader perspective on this phenomenon, exploring research areas beyond marketing. A cross-disciplinary perspective on the sensory dimension provides much needed insights on the interplay and activation of all senses and their effects on perceptual and behavioral outcomes. Drawing on neuroscientific and cognitive science insights and combining these with existing knowledge in service and marketing research, three integrative research directions to advance service and marketing research are proposed: increasing an understanding of (1) multisensory stimuli integration and perception, (2) the role of emotions in multisensory customer experiences, and (3) the influence of multisensory stimuli on behavioral outcomes.

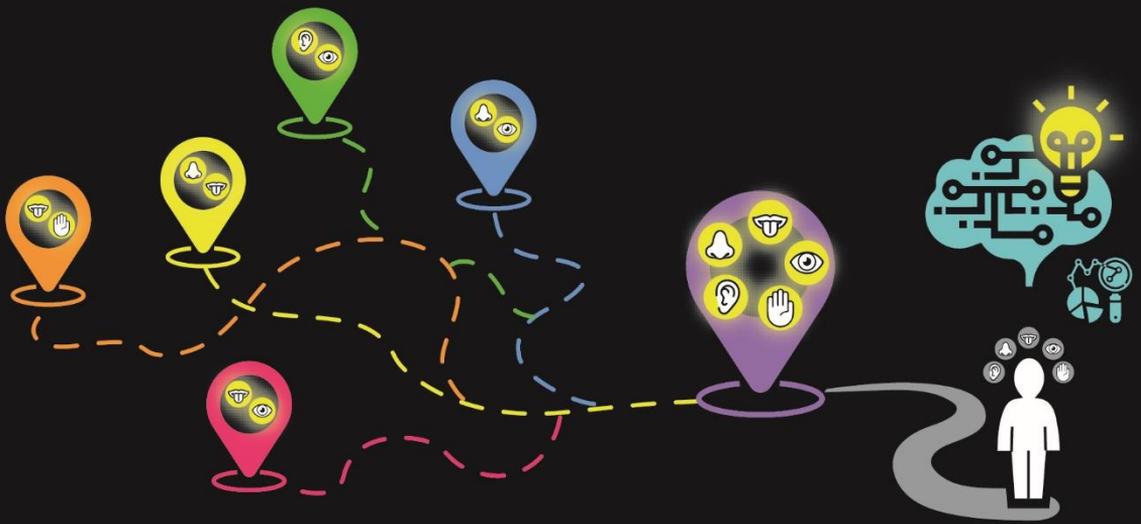
Manuscript 3 takes a finer-grained perspective on multisensory CSE. Introducing the concept of schematic information processing, this

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manuscript uses an ethnographic schema elicitation technique (ESET) to unravel how customers (1) select sensory stimuli from the service environment, (2) match these stimuli with a set of existing schemas that are stored in form of experience memories, (3) evaluate whether or not existing schemas need to be modified to fit the current encounter and purpose, (4) and how these schemas are used to guide cognitive, emotional and behavioral responses. The findings of this study suggest that schematic information processing is the underlying process of CSE. Understanding this process is therefore vital for understanding why and how customers act the way they do across the customer journey, and what leads to their cognitive, emotional or behavioral responses at a touchpoint-specific level.

About the author





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Susan Stead was born in Stolberg, Germany on March 11th, 1989. After completing her Abitur at Inda Gymnasium, Aachen Germany, Susan got enrolled at Zuyd University of Applied Science in Maastricht, the Netherlands. During this four-year International Business Bachelor's program, she went on an exchange semester to Bishop's University in Quebec, Canada and completed a six-month internship at the Marketing department of global geographical information system provider in Wellington, New Zealand. After completing a Premaster Minor in 2013, Susan graduated from Zuyd University with a Bachelor in International Business (BSc.) and major in Strategic Marketing.



In 2014, following a one-year master program at Maastricht University, Susan graduated with distinction (cum laude) in International Business (MSc.) with a specialization in Strategic Marketing. In September 2014 she accepted a position as a Project Management Assistant, and later Project Leader at the Service Science Factory (SSF) of Maastricht University. During her work at SSF, Susan managed and led several consultancy projects with diverse industry clients that taught her several customer-centric service design tools and methods to develop meaningful service innovations. The insights and knowledge gained from these co-created, short-term consultancy projects, triggered her interest in CSE research. In September 2015, she accepted a position as a doctoral student at the Department of Marketing and Supply Chain Management at the School of Business and Economics at Maastricht University.

Her doctoral research explores the role of senses and multisensory stimulation in customer service experiences. All three manuscripts of her dissertation have been presented at leading international conferences such as Frontiers in Service 2017 in New York, 2018 in Austin, and 2019 in Singapore. In addition, she presented at QUIS15 2017 in Porto, Portugal, and at LaLonde Service Conference 2018 in LaLonde les Maures, France. Furthermore, Susan attended several international workshops such as Let's Talk About Service 2015 in Namur, 2017 in Antwerp, and in 2018 in Ghent, Belgium, and participated in three Service Design workshops: at

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Politecnico di Milano, Milan, Italy, at Köln International School of Design in Cologne, Germany, and at the ServDes conference in Copenhagen, Denmark. In 2017 Susan attended an intense ethnographic research course at the University of ESSEX in Colchester, England. In line with her research expertise, she also served as a reviewer for the Journal of Services Marketing.

During her PhD, Susan was involved in teaching and coordination activities of several International Business master courses such as Marketing Innovation Management, Research for Marketing Decision Making, Service Design and Service Design Skills. In addition, over a five-year period, Susan mentored PREMIUM Honours-program projects that are run by highly skilled and motivated, multidisciplinary students, who deal with complex challenges of leading national and international companies.