Design of Technology-Enabled Interactions for Flow Experience in an Omnichannel Customer Journey

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Abstract

The omnichannel retail strategy has become increasingly popular in recent years as retailers strive to provide a seamless customer experience across all channels. However, multiple studies indicate that retailers are facing challenges in delivering desired experiences in an omnichannel environment. Given this uncertainty faced by many retail firms in an environment with multiple channels, it is imperative for researchers to discern and utilize the factors that improve the customers' flow when customers are moving between channels. Digital technologies play a vital role in delivering this experience, but retailers need design guidelines to utilize the potential of these technologies effectively.

This research addresses this problem by introducing the omniflow framework, a design framework for improving the flow experience in the digital technology-enabled cross-channel customer journey. The study employed the design science research methodology and evaluated the design framework through an in-depth case study with an Irish retailer. This study explores the elements that enable integrated customer interactions with touchpoints across different channels within and outside retailers' direct control. This study identified the technologies and digital solutions that act as enablers for channel integration activities. It also identifies the various dimensions that constitute the flow experience and proposes design principles linking the dimensions of the flow experience and the design of technology-enabled interactions.

The study advances design theory by establishing a link between the design of technology-enabled interactions and the flow experience. The study's findings also contribute to a clearer understanding of the differences between retailer-controlled channel integration and the flow experience in the customer journey, which extends beyond the retailer's control. The results of the study also offer practical insights for retailers seeking to enhance the omnichannel experience for their customers.

List of Publications

No	Publication	Contribution to the thesis
1	**Iftikhar, R.,** Pourzolfaghar, Z. & Helfert, M. (2019). Omnichannel Value Chain: Mapping Digital Technologies for Channel Integration Activities. In ISD 2019 Proceedings). Toulon, France	Identification and understanding of the channel integration activities in omnichannel retail
2	Nabbosa, V. L., & **Iftikhar, R.** (2019). Digital Retail Challenges within the EU: Fulfilment of Holistic Customer Journey Post GDPR. In Proceedings of the 2019 3rd International Conference on E-Education, E-Business and E-Technology (pp. 51-58).	Identification of challenges in delivering a connected customer journey in the EU
3	**Iftikhar R.,** Pourzolfaghar Z., Helfert M. (2020) Omnichannel Value Chain: Mapping Digital Technologies for Channel Integration Activities. In: Siarheyeva A., Barry C., Lang M., Linger H., Schneider C. (eds). Lecture Notes in Information Systems and Organisation, vol 39. Springer, Cham.	Identification and understanding of the digital technologies that are fundamental to channel integration in omnichannel retail
4	Polasik, M., Huterska, A., **Iftikhar, R.,** & Mikula, Š. (2020). The impact of Payment Services Directive 2 on the PayTech sector development in Europe. Journal of Economic Behavior & Organization, 178, 385-401.	Alignment with the identification of enabling technologies.
5	Cakir, G., **Iftikhar, R.,** Bielozorov, A., Pourzolfaghar, Z., & Helfert, M. (2021). Omnichannel retailing: Digital transformation of a medium-sized retailer. Journal of Information Technology Teaching Cases, 11(2).	Understanding the challenges faced by an omnichannel retailer
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9	**Iftikhar R.,** Helfert M. (2023). Development and evaluation of a design framework for Flow Experience in omnichannel retail.	Design and Evaluation of the omni flow framework

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List of Definitions

- **Channel**: A channel is the medium of interaction between a customer and an organization (Gallino & Moreno, 2014).

- **Customer Journey**: A customer journey is the path that a customer takes as they interact with an organization during the purchase cycle. It can be across a single or multiple touch points (Lemon & Verhoef, 2016).

- **Customer Experience:** Customer experience is the internal and subjective response that a customer has to their interactions with a company's various touchpoints (Lemon & Verhoef, 2016).

- **Customer Value**: Customer value refers to the benefit or increase in customer wellbeing that results from an interaction with an organization (Hardyman et al., 2019).

- **Design Framework:** The design framework provides a low-level integration of different model types, which allows the various models to be used together and facilitates the design process (Hüfner et al., 2012).

- **Encounter**: refers to the instances when a customer and a retailer interact, either through physical or virtual means (Larivière et al., 2017).

- **Flow Experience:** refers to customers' perception of the transition between different channels/touchpoints during their customer journey (Shi et al., 2018).

- **Interaction**: The engagement between a customer and service provider that takes place within the context of a service, and can involve people, objects, processes, and environments (Bagdare & Jain, 2013).

- **Information Architecture:** An architectural approach aimed at identifying major information categories and their relationships to other components that supports the information exchange processes to provide information with the right content and in the right context (Tan et al., 2013; Xie et al., 2012).

- **Service Design**: The field of research concerned with developing, designing, or enhancing services (Boak, 2021).

- **Technology-Enabled Interaction:** Interaction with customers facilitated by customer-facing technology-based methods, tools or devices (Li et al., 2017).

- **Touchpoint:** A touchpoint represents a specific interaction between a customer and an organization. It includes the device being used, the channel used for the interaction, and the specific task being completed (Baxendale, 2015).

- **Third-Party Touchpoint**: A touchpoint within a customer journey which is controlled or owned by another entity and the retailer has no direct control over it (Santos & Gonçalves, 2022).

Chapter 1

Introduction

1.1. Background

Most retailers today are striving to differentiate themselves from the competition by offering customers a better shopping experience (Chang & Li, 2022; Gao et al., 2021; Hilken et al., 2018; Parise et al., 2016). Multiple studies support this approach from retailers by verifying that a positive customer shopping experience improves customer satisfaction and this ensures a competitive advantage for retailers (Chi et al., 2016; Russo et al., 2018; Savastano et al., 2019). To provide a better customer experience, retailers are investing significantly in different technologies (Roy et al., 2017). This investment is intended to help retailers offer better services and more convenient shopping experiences to their customers. At the same time, customers are using multiple channels to complete their shopping journeys and are often finding creative ways to use these channels to their advantage. For example, customers may use a combination of online and in-store channels to research products, compare prices, and make purchases. Access to different tools and technologies has changed the way customer shop in the current retail environment (Kumar et al., 2019). Shopping patterns such as researching items online before buying them in the physical store (also known as webrooming), or looking through the products in-store before purchasing them online (also known as showrooming) have become common in retail customers (Flavián et al., 2019; Hall & Towers, 2017; Rodríguez-Salvador et al., 2016). According to a recent survey by Statista, 73% customers consult their phones when making instore purchases (Aiolfi et al., 2022).

Both these factors (i.e. changed customer behaviour, technology investment by retailers) are essentially changing the way of interaction between customers and retailers (Larivière et al., 2017; Valentini et al., 2020) . This has motivated retailers on turning their strategies towards the embracement of the omnichannel concept to provide their customers with a seamless shopping experience (Mirsch et al., 2016). Retail researchers and practitioners recommend

the implementation of an omnichannel approach (integration of offline and online channels) for retailers to adapt to these changed customer behaviours (e.g. Piotrowicz and Cuthbertson, 2014; Lemon and Verhoef, 2016; Chen, Cheung and Tan, 2018; Shi et al., 2020). The omnichannel approach has been linked to increased loyalty in customers using multiple channels in recent studies (Hossain et al., 2020; Kuehnl et al., 2019; Savastano et al., 2019). Even though retailers have accepted and started implementing an omnichannel strategy, the extent to which such a strategy can achieve the desired results greatly depends on customers' perception and usage of the delivered omnichannel service (Shen et al., 2018). To become successful omnichannel retailers, they should provide a seamless transition experience to their customers when they navigate across channels (Hansen & Sia, 2015; Koetz, 2019). In today's retail environment, many retailers are facing uncertain times and are struggling to provide a seamless experience across multiple channels. In this context, it is crucial to understand and take advantage of the design factors that improve the customer flow when customers move between channels (Hult et al., 2019; Neslin, 2022).

Unquestionably, digital technologies play a vital role in providing the desired experience (Pantano & Dennis, 2019; S. Shen et al., 2020). These technologies facilitate the movement of customers between channels, making it easier for them to interact with retailers. However, the constant evolution of technologies means that retailers need to re-evaluate their customer interaction design approach to effectively utilize the potential of these technologies in delivering a positive customer experience. This may involve developing new design frameworks or guidelines or simply adjusting existing strategies to take advantage of new technologies and changing customer preferences.

1.2. Problem Statement and Motivation

Omnichannel strategies are complex to implement because they require retailers to integrate data and IT systems across multiple channels, including in-store, online, and mobile, into a single, seamless experience for customers (Cocco & Demoulin, 2022). This can be challenging, especially when it comes to aligning the retailers' systems with the technologies customers are using. As a result, many retailers struggle to implement omnichannel strategies effectively, leading to a poor ability to deliver a positive customer experience. The studies into the behaviour of omnichannel customers suggest that most retail customers are currently not satisfied with the cross-channel flow experience; therefore, this is a particular

area of concern for retailers (Chang & Li, 2022; Parise et al., 2016). According to a recent survey, 60% of omnichannel customers said they would switch retailers if they had a negative experience with disconnected and inefficient communication across various channels and customer interactions during their shopping journey (Chang & Li, 2022).

Cross-channel flow is a phenomenon that occurs when a customer engages with a retailer through multiple channels, such as a website and a physical store, during their purchase journey. An example of this is when a customer looks up a product on a retailer's website and then visits the physical store to see the product in person before making a purchase. Retailers that do not provide connectivity between their channels will be unable to assist the customer in their journey, requiring them to use third-party services or word-of-mouth to find the right store and search for the product on their own once they arrive. In contrast, retailers that do provide cross-channel flow will have systems in place to facilitate the customer's journey, making it easy for them to find the right store and be directed to the product they're looking for once they arrive. Overall, offering cross-channel flow can provide a smooth and seamless customer experience, regardless of the channels they use.

A significant challenge for organizations is the intricacy of managing customer interactions across an ever-increasing range of channels (Polo & Sese, 2016). According to a survey by Brightpearl, only 8% of organizations believe they currently meet their customers' expectations for a seamless omnichannel shopping experience (Cocco & Demoulin, 2022). Another survey of customer experience leaders in retail showed that 65% felt unable to deliver a consistent cross-channel experience (Polo & Sese, 2016). Moreover, due to the lockdowns induced by the pandemic, many retailers have transformed into either multi or omnichannel retailers (Hwang et al., 2020). Along with the continuous increase in the availability of new digital channels, the number of different touchpoints customers can use in their purchase journey has increased exponentially (De Keyser et al., 2020; Tueanrat et al., 2021). While numerous studies have demonstrated the importance of providing a high-quality customer experience across multiple touchpoints for the success of an omnichannel retailing strategy (Shi et al., 2020), there remains a limited understanding of how to create frictionless shopping journeys. As a result, retailers need assistance in designing frictionless transitions, or "flow," between relevant touchpoints.

1.2.1. Problem in the context of Irish Retailer

As part of this research, a long-term case study with an Irish retailer (called "IR" thereafter) was conducted from March 2019 to October 2022, resulting in a deeper understanding of the underlying causes of the problem and its underpinning. At the outset of the engagement, IR was transitioning towards an omnichannel approach by integrating online and offline channels to provide a seamless customer experience. This transition was accelerated by the COVID-19 lockdown, which resulted in a significant drop in footfall at IR's physical stores. This prompted the company to seek out innovative digital technology solutions to restructure its customer-retailer interactions. The development of these solutions, such as a virtual reality (VR) store, increased engagement at that particular touchpoint of the customer journey.

Despite this increase in engagement, the VR store did not lead to an overall improvement in the customer experience because the transition to other touchpoints from the VR store was not smooth. Addressing this problem was challenging for IR, as it involved third-party systems that could not be quickly or easily changed. To resolve this issue, IR needed to understand the design process for delivering a smooth flow experience. This led to the formulation of the problem related to the lack of actionable guidance for ensuring flow in the customer journey across different channels. Section 3.4 presents a detailed description of the case study, while Chapter 4 provides an in-depth description of the problem formulation process.

1.3. Research Objectives and Research Questions

1.3.1. Research Objectives

This research aims to address the problem of providing smooth cross-channel flow experiences for customers, as introduced in the previous Section 1.2, using design science research. The study will investigate how retailers can design interactions with customers for a smooth transition between different touchpoints in the customer journey, in terms of cognitive, emotional, content, task, and interaction flow. It will involve designing and evaluating a framework for improving flow experiences in digital, technology-enabled cross-channel customer journeys. The goal is to help retailers provide a better experience for customers by enabling them to easily access the information they need and move between channels without experiencing disruptions or roadblocks. This requires a radical shift in the

way retailers approach information access during the customer journey. In today's retail environment, with its many channels, customers can change or influence the current and future state of their interactions with retailers through the information they use. To adapt to this dynamic environment, retailers need a new design framework that enables them to take advantage of the potential of digital technologies. This research will also explore the elements of the retail service landscape that enable customer interactions with touchpoints across different channels, both within and outside the direct control of retailers. This complex web of relationships is not well understood in existing literature, making the research presented in this work critical for ensuring the design and implementation of an enhanced flow experience for customers of omnichannel retailers.

1.3.2. Research Questions

To address the identified problem and achieve the research objectives, the main research question aims to explore how technology-enabled interactions can enhance the flow experience in an omnichannel retail customer journey.

Main Research Question: How to design technology-enabled interactions to enhance the flow experience in an omnichannel retail customer journey?

This question is divided into three sub-research questions, each focusing on a specific aspect. The first sub-research question aims to identify the main dimensions of flow experience in an omnichannel retail setting. Understanding the key dimensions that contribute to the flow experience allows the identification of relevant technologies and formulation of the interaction design.

RQ. 1 What are the main dimensions of flow experience in an omnichannel retail setting?

The second sub-research question explores the technologies that enable channel integration and contribute to enhancing the flow experience. By identifying the most effective technologies, retailers can optimize their interaction design across all touchpoints.

RQ. 2 What are the most effective technologies that enable channel integration and enhance the flow experience in an omnichannel retail setting*?*

The third sub-research question delves into the design and evaluation of retail interactions, exploring the key design elements that affect the flow experience and how information exchanged between touchpoints can be managed. Additionally, this sub-question

investigates how the effectiveness of technology-enabled interactions in enhancing the flow experience can be evaluated and measured, allowing retailers to gauge the success of their design. It is further subdivided into three parts (3.1 to 3.3).

RQ. 3 How can omnichannel retail interactions be designed and evaluated?

3.1. What are the key design elements in an omnichannel retail interaction system that affect the flow experience?
3.2. How can the information exchanged between different touchpoints be managed during the omnichannel customer journey?
3.3. How can the effectiveness of technology-enabled interactions in enhancing the flow experience be evaluated and measured?

1.4. Overview of Methodology

The adoption of interpretive epistemology and a constructive view of ontology underpins this research. Design science research methodology is applied in this research. Design science research consists of mainly three iterative parts: i). Problem identification and objective formation, ii). Design and development of the artefact and iii). Application and evaluation of the artefact. This study has its philosophical underpinning in interpretivism in line with the views of Niehaves (2007). Design science research methodology is selected for this research as it fits the interpretivist paradigm and is suitable for understanding customer-retailer interactions.

The design science research process consists of iterative steps (Mullarkey & Hevner, 2019; Sein et al., 2011). The research process has multiple iterations between the design and evaluation phases instead of one phase following the other in a waterfall process (Purao, 2013; Vaishnavi & Kuechler, 2015). The overall research approach is mainly adapted from Peffers et al. (2007) and Vaishnavi and Kuechler (2015). The data collection and analysis details are then linked to each of the three main stages. The three main stages are not linear, showing the design science research's iterative nature. Input from these steps is used to improve the artefact, which is then again evaluated, thus adding the rigour cycle as recommended by Hevner and Chatterjee (2010). The research methodology approach is thoroughly described in Chapter 3, with detailed accounts of the design science approach provided in Section 3.3.

1.5. Significance and Contribution of the Research

This section presents a summary of this study's significance and its main contributions. There has been a growing scholarly interest in investigating the impact of partner-controlled, customer-controlled, and social/external touchpoints on the design of omnichannel customer journeys, as reflected in several academic calls for research in this domain (Cocco & Demoulin, 2022; Wagner et al., 2018). For example, "How does customer experience with noncontrolled touchpoints affect customer experience with firm-controlled touchpoints?" is one of the research questions posed by Keyser et al. (2020). In current omnichannel retail literature, the predominant perspective centres on the application of distinct touchpoints, which fails to fully account for the intricate nature of interactions that arise as a result of hyperconnectivity, the surge in the use of digital sensors, augmented and virtual reality, and in-store digital activities (Mele & Russo-Spena, 2021). This research addresses this emerging area of enquiry.

Secondly, the extant design models and frameworks for interaction and service design, such as the service blueprint (Bitner et al., 2008), multilevel service design (Patrício et al., 2011) and customer journey mapping (Norton & Pine, 2013) are primarily centred on the customer's perspective. They do not account for how retailers establish the context for the experience in conjunction with the customer journey, considering both noncontrolled and firm-controlled touchpoints. This study represents an advancement in the comprehension of both controlled and non-controlled touchpoints from the customer as well as the retailer's perspective. By combining retailers' and customers' perspectives, this study serves as a response to the calls for developing design approaches combining different perspectives (Hollebeek et al., 2022; Kranzbühler et al., 2018; Vrontis et al., 2017).

The main contribution of this research is the proposed omniflow framework, a multi-level design framework to address the challenge retailers face in designing interactions that can enhance the flow experience for their customers across different channels. The framework consists of three levels of design i. System design ii. Encounter design, and iii. Assessment design. It provides a low-level integration between the design levels, which allows them to be used together and makes the design process easier. The proposed models guide the design of customer-retailer encounters at internal and external touchpoints by using an interaction

model for system-level design, information architecture for encounter design, and a dashboard for monitoring the flow experience.

As advancement in technologies and social networking has enabled third parties to become a direct part of the customer experience process, research requires a better understanding of customer experience design in terms of the third party and customer-to-customer interactions. The study provides deep insights into designing an omnichannel customer experience. The study's contribution lies in modelling the constituents of customer experience in a retail system and proposing the designing of customer experience using a system design model which accounts for diverse aspects of the omnichannel retail ecosystem and the relationships between them. The study offers insights into changing scenarios of retail customer experience, describing the different interactions with retailer-controlled factors, third party technologies and services, as well as customer-to-customer interactions.

The study makes two more significant theoretical contributions to omnichannel experience design. First, it identifies the various dimensions that constitute the flow experience. Second, it advances design theory by establishing a link between the design of technology-enabled interactions and the flow experience.

1.6. Structure of the Thesis

The remainder of this thesis will be structured as follows:

Chapter Two presents the extant literature on customer experience, service design, and omnichannel retail design in the context of technology-enabled interaction design. The chapter also provides an overview of the kernel and design theories that support the design of the artefact. It also offers a synthesis of the existing (fragmented) accounts of flow experience and highlights the existing conflicts and different perspectives on it. Overall, this chapter serves as a bedrock for the design and implementation discussed in the subsequent chapters.

Chapter Three outlines the methodological approach used in the study, with a focus on the design science research process. It explains the rationale for the chosen research methodology and the research methods used for data collection and analysis. The chapter argues the appropriateness of using a case study to develop and evaluate the design

framework, which is the main focus of the study. This chapter also provides a detailed description of the case study.

Chapter Four presents findings from the problem identification phase. This chapter describes and discusses the results of the problem identification phase, which forms the starting point of the design science research process.

Chapter Five introduces the design framework developed in this research, which includes system, encounter, and assessment design concepts to ensure a positive flow experience for omnichannel retail customers by providing a smooth transition between different touchpoints.

Chapter Six includes the presentation of the demonstration and evaluation phase of the research. It described the use of the proposed design framework in designing three new interactive services in an omnichannel retail context. The chapter details the deployment process, and learnings from the deployment of two versions of the virtual reality store, omnichannel loyalty programme and remote sales assistant. It also describes the evaluation approach and presents the evaluation criteria and the data analysis showing the results from interviews and focus groups with retail practitioners.

Chapter Seven discusses the main findings of this research. It compares and contrasts the findings from this study by reflecting on the literature. It presents the main knowledge contribution of this research and the managerial implications. The chapter also develops a discussion of limitations and potential avenues for future research. It concludes with final remarks.

Chapter 2

Literature Review

This chapter presents a review of the literature on customer experience, omnichannel retail design and service design in the context of designing technology-enabled interactions for flow experience in an omnichannel customer journey. Due to the interdisciplinary nature of this research, as illustrated in Figure 2.1, pertinent articles on this subject are dispersed across various domains. However, the primary focus of the literature review is on marketing, service management, and information systems literature. Consequently, this review concentrates on identifying the most relevant concepts from these domains to facilitate an in-depth understanding of the research topic. The structure of this literature review is organized following the framework presented in Figure 2.2. Appendices are used to detail the literature review process for the following themes: Appendix A – Flow Experience; Appendix B – Customer Experience; and Appendix C – Channel Integration and Appendix D- Customer-Retailer Interactions while a concept-centric approach by Webster and Watson (2002) was adopted to perform a structured review for Knowledge gap analysis described in Section 2.5.

The literature review chapter in this thesis serves three distinct purposes. Firstly, it presents a comprehensive state-of-the-art overview of the research topic, highlighting any gaps in the current knowledge base. This serves to situate the research within the broader context of existing literature and to identify areas where further investigation is needed. Secondly, the literature review establishes the requirements for designing technology-enabled interactions that can facilitate flow experience. To this end, it draws on the existing literature to identify key principles and best practices. Finally, it provides valuable input for the development of the researcher's own design, drawing on the insights and findings from previous research to inform the creation of the artefact. In this way, the chapter serves as a critical component of the thesis, helping to ensure that the research is focused, relevant and contributes to the existing literature.

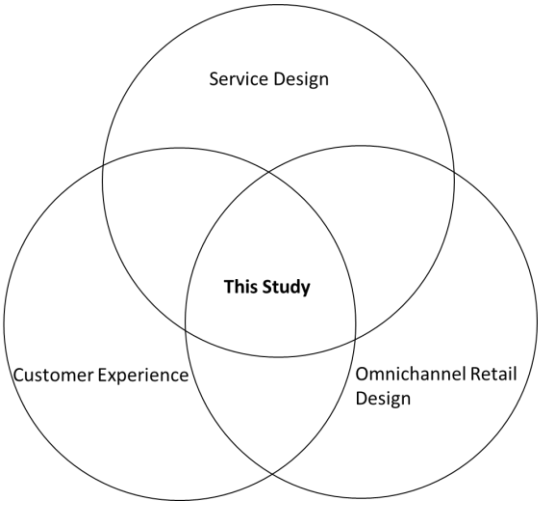


Figure 2.1. Interdisciplinarity of the research

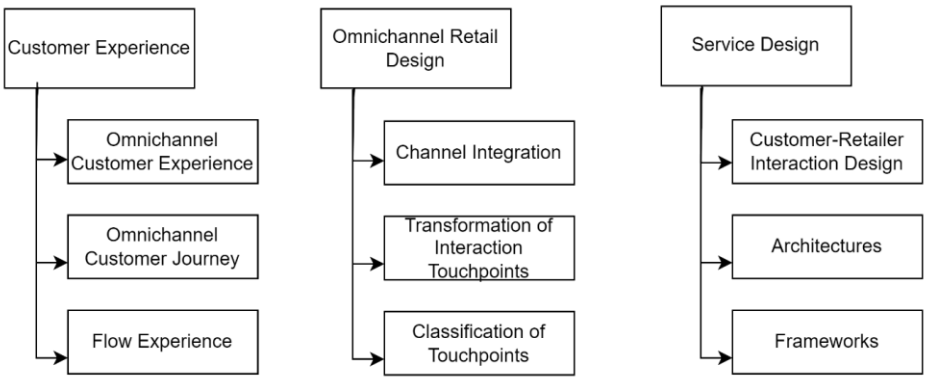


Figure 2.2. Literature Review Overview

2.1. Customer Experience

Customer experience is the internal and subjective response that a customer has to their interactions with a company's various touchpoints (Lemon & Verhoef, 2016). It is the result of a customer's interactions with a brand across various touchpoints, which come together to create a continuous, cohesive experience. These touchpoints can be direct (e.g., speaking with a customer service representative) or indirect (e.g., seeing an advertisement), but they all contribute to the overall customer experience. This response is unique to each individual customer and can vary depending on their interactions with the company (Quach et al., 2020). It is the lived experience of a customer interacting with a company. This experience is also shaped by the customer's responses to these interactions and ultimately forms their overall perception of the brand (Bastiaansen et al., 2019; Boak, 2021). The focus of this

section is on reviewing the literature on customer experience from the digital retail perspective.

Customer experience in retail encompasses active transactional and non-transactional interactions of a customer with the retailer, third parties and other customers (Lemon & Verhoef, 2016; Mosquera et al., 2017). Customer experience mainly results from direct interaction with retail employees or digital service interfaces, indirect communication and the actual use (Wong et al., 2016). This includes core, pre-and post-core phases of an offering and can be face-to-face in an actual service setting or online (Voorhees et al., 2017). Verhoef et al. (2009) developed a conceptual model of customer experience creation and identified "social environment, service interface, retail atmosphere, assortment, price and promotions, retail brand, customer experiences in alternative channels, and previous experiences with the company as independent variables impacting the customer experience" (Verhoef et al., 2009, p.33). Customer experience is, however, not solely shaped by the retailer-controlled variables (e.g. store layout, advertisement, frontline shop assistant, etc.) but is also impacted significantly by the customers' constructs that companies do not control (the aim of shopping, personal circumstances, etc.) (Meyer & Schwager, 2007). It also has two different perspectives. Customers' perspective of customer experience is the experiential perspective which is phenomenological in spirit and regards consumption as a primarily subjective state of consciousness with a variety of symbolic meanings, hedonic responses, and aesthetic criteria (Lemon & Verhoef, 2016). On the other hand, from a retailer's standpoint, an experience occurs when a customer has any sensation or acquires knowledge from some level of interaction with the elements of a context created by the retailer (Kranzbühler et al., 2018a).

The social experience is a crucial component of customer experiences, as it involves customer interactions with other customers within the retail environment. The social context can shape customers' perceptions of the experience, affecting their emotional states, behaviour, and cognition (Kranzbühler et al., 2018a). Customers compare themselves to and identify with others, and perceived similarity can make them feel more comfortable. However, customers may also experience negative social responses, particularly in a physical retail environment due to factors such as crowding, close proximity, eye contact, or appearance, as well as other disruptive behaviours (Boak, 2021). Conversely, interacting with other customers can also generate positive effects, such as social support, information

sharing, and help-seeking. Socializing and meeting people can also be an essential aspect of customer experiences, along with making purchases or seeking information.

Previous research has shown that customers are more likely to make a purchase when shopping with family and friends, emphasizing the importance of social experience in influencing customers' decision-making (Colm et al., 2017). Therefore, retailers should also consider the social context of customer experience and design environments that foster positive social interactions while minimizing negative ones. By doing so, retailers can enhance customers' overall experience.

2.1.1. Omnichannel Customer Experience

Omnichannel retail is defined as the synergic offering of all available channels and customer touchpoints to optimize customer experience and performance across channels (Piotrowicz & Cuthbertson, 2014; Saghiri et al., 2017). Omnichannel experience refers to the customer experience across a retailer's various channels, such as in-store, online, and mobile apps. Omnichannel customer experience is achieved when the customer perceives every channel as a continuum of interaction with the firm. It is the extent to which customers feel movement between channels as natural, unhindered, and continuous (Shi et al., 2020). Empirical results from recent studies demonstrate that omnichannel customer experience exerts a statistically significant and positive effect on service usage (e.g. Shen *et al.*, 2018). The optimized omnichannel environment provides a seamless experience for customers in which they have the ability to easily switch between channels and touchpoints during different phases of their customer journey. A seamless omnichannel environment eliminates barriers between channels and allows customers to choose their preferred channel (Rodriguez-Torrico et al., 2021). Omnichannel usage is affected by customer characteristics such as multichannel ability, price consciousness, time pressure and loyalty proneness, which could have a moderating effect on the relationship between omnichannel integration and their perceived experience (Boak, 2021; De Keyser et al., 2020).

While there is no consensus on the specific components of the omnichannel experience, it is generally considered to be a holistic concept that includes different factors. These factors may include personalization, flexibility, consistency, integration, and connectivity, as well as cognitive and emotional fit, flow, immersion fidelity, and spatial presence (Hilken et al., 2018; Shi et al., 2020). Other factors that may be relevant to omnichannel experience include

perceived risk, consumer innovativeness, convenience seeking, and shopping enjoyment (Mahrous and Hassan, 2017).

Quach et al. (2020) suggested that flow and perceived privacy risk are two important elements of customers' omnichannel experience. Flow, or fluency, is a psychological state in which people are completely absorbed in an activity, enjoying it and feeling intense emotions (Hilken et al., 2018). In the context of customer experience, flow can be an important factor contributing to overall satisfaction and enjoyment. However, customers may also be concerned about the potential risks associated with sharing their personal information across different channels in omnichannel retailing. These risks can include unauthorized access, use, or sharing of individuals' data and may negatively impact customers' experience with omnichannel retailers. Therefore, a comprehensive understanding of omnichannel experience should take into account both positive and negative aspects, such as flow and perceived risk.

The specific components of omnichannel experience may vary depending on the research perspective and the particular context in which it is studied (Quach et al., 2020). From a customer's perspective, few recent studies have tried to identify key dimensions of omnichannel customer experience. Shi et al. (2020) identify five dimensions (connectivity, integration, consistency, flexibility and personalization) of omnichannel customer experience using qualitative research design for a fine-grained conceptualization of omnichannel customer experience. We posit that based on the value in use the customers seeks from the interactions in a customer journey (e.g. utilitarian, hedonic), the enhanced flow will result in better overall omnichannel experience.

Table 2.1. Evolving literature on omnichannel customer experience

Sample Component	**Study Type**		**Perspec-tive**		**Focus**			**Main Independent Construct**				**Main Dependent Construct**			
	Conceptual	Empirical	Retailer	Customer	Technology Use/Acceptance	Marketing	Design/Architecture	Overall Customer Experience	Channel Choice/Channel Use	Flow Experience /Perceived	Integrated Interaction Quality	Customer Loyalty	Purchase Intention	Continued Usage	Customer Satisfaction
(Siqueira et al., 2020)	x		x			x		x							
(Zaware et al., 2020)		x		x	x				x				x		
(Valentini et al., 2020)		x		x		x			x				x		
(Mainardes et al., 2020)		x		x						x	x	x			
(Hossain et al., 2020)		x	x			x					x				
(Zhao & Deng, 2020)		x		x		x		x					x		
(Shi et al., 2020)		x		x		x			x				x		
(Savastano et al., 2019)		x	x		x			x							x

(Bèzes, 2019)	x		x	x	x	x		x							
(Kumar et al., 2019)	x		x			x		x							x
(Suarez & Avila, 2019)	x		x				x				x				
(Hickman et al., 2019)		x		x		x		x							x
(Alexander, 2019)		x	x				x	x							
(Hamouda, 2019)		x	x			x		x			x				x
(Harada, 2019)	x		x				x								
(Hilken et al., 2018)	x		x		x			x							
(Shen et al., 2018)		x		x		x				x				x	
(Parise et al., 2016)		x	x				x	x							
Total per type (Overall Reviewed = 45)	18	27	31	24	16	25	4	25	14	3	14	9	7	8	8

2.1.2. Omnichannel Customer Journey

The customer journey refers to the entire sequence of interactions between the customer, provider, product, or service, including their order and interdependence, from the customer's point of view (Boak, 2021). The customer journey is a series of touchpoints that customers encounter, which includes human, product, service, communication, spatial, and electronic interactions between a provider and its customers (Tueanrat et al., 2021). This approach is dynamic and focuses on the customer's actual experience at individual touchpoints during their journey rather than what the provider intends.

The customer journey is a process that customers undergo to access or use a company's offering, involving multiple touchpoints that impact their overall experience (Stein & Ramaseshan, 2016). According to Gestalt theory, customers perceive the entire shopping experience as a unified entity rather than analysing each element in isolation (Cocco & Demoulin, 2022). This suggests that measuring the sum of customers' evaluations of each interaction with channels or touchpoints separately is not very useful, as the whole is greater than the sum of its parts. From a customer experience perspective, the customer journey is divided into different phases, such as pre-purchase, purchase, and post-purchase, and from the service design perspective, encounters can be divided into pre-, core and post-service encounters. This division allows better analysis of customer experience, as customers may be in different states of mind at different points (Voorhees et al., 2017). The customer journey is, therefore, a semantic representation for identifying the key aspects of the customer experience (Boak, 2021).

Overall, the customer journey is a vital concept in the omnichannel customer experience literature, as it helps in understanding how and why customers interact with different touchpoints and how their experience is impacted by different touchpoints. It is a dynamic process that extends beyond just the direct encounter with the retailer itself and involves multiple phases, with each phase having a unique impact on the overall customer experience.

2.1.3. Flow Experience

The term “flow experience” has its origin in psychology with Csikszentmihalyi (1996) defining it as “the optimal experience as a mental state of extremely rewarding concentration that emerges in the space between frustration and boredom”. Csikszentmihalyi (1996) identified several key features associated with flow experience. We do borrow some features from these including clear goals, immediate feedback, merging of action and awareness for the understanding of flow experience in the context of omnichannel retail (Pilke, 2004). However, flow experience in the context of omnichannel retail, also referred to in the literature as fluency (Marutschke et al., 2019; Shi et al., 2020) or seamlessness (Chang & Li, 2022; Cocco & Demoulin, 2022; Lim et al., 2018) is characterized by the integrated interactions with the retailer across different channels, allowing customers to smoothly move between them (Cocco & Demoulin, 2022). There is a lack of a widely accepted term for flow experience in omnichannel retail literature and also a lack of common understanding in terms of its constituents (Chang & Li, 2022). Table 2.2 lists some recent usage of terms and

the definition proposed in the literature. In this thesis, we use the term “flow experience” to describe this phenomenon (Parise et al., 2016).

Table 2.2 Definition of Flow experience.

Terminology	Definition	Study
Flow	The degree to which a customer can navigate effectively through various touchpoints.	(Parise et al., 2016)
Seamlessness	"seamlessness" describes the level of ease that customers feel when transitioning between various channels or touchpoints throughout their shopping experience.	(Huré et al., 2017)
	“Seamlessness is a quality of any cross-channel customer journey where the transitions (or handoffs) from one channel to the next involve zero or minimal overhead for users.”	(Salazar, 2017, para.8)
Fluency	Fluency in the customer experience refers to the degree to which customers have a smooth, uninterrupted, and natural experience with a company, brand, product, or service over time and across channels.	(Marutschke et al., 2019)
Seamless Experience	“The extent of the interconnectivity between touchpoints, and the efficiency of customers’ migrating shopping tasks across touchpoints throughout the entire shopping journey.”	(Chang & Li, 2022, p.102800)

Transitions between touchpoints (flow experience) can enhance the overall customer experience in several ways. First, they can help retain or improve the customer's context by providing relevant information or maintaining the customer's state within the product or service. For example, if a customer is browsing a product catalogue on a website and clicks on a product to view more details, the transition to the product page could include information about the product's price, availability, and features, which helps the customer understand the product in the context of their needs and goals. If the transition is slow or confusing, the customer may lose interest or become frustrated. On the other hand, if the transition is fast and intuitive, the customer is more likely to stay engaged and continue using the product or service. Transitions between touchpoints can be aesthetically pleasing and fun, which can improve the overall enjoyment of the user experience. They can also reinforce branding when done in a way that aligns with the company's style and values. For example, a transition that includes the company's logo or colours can help create a cohesive and

consistent experience by maintaining the similarity of each interaction with a touchpoint as the consumer switches between channels (Verhoef et al., 2015). When the channels of a single retailer are perceived as part of the same brand, with the same information, look and feel, transitions between them are seamless. However, if there is a lack of consistency, such as differences in prices between the store and online, the shopping journey becomes inconsistent, and the customer may hesitate to continue. This shows the importance of the similarity between channels and touchpoints in creating a consistent shopping experience across channels (Cocco & Demoulin, 2022). Second, this involves the smooth movement between channels and touchpoints without the need for additional effort or complexity. When switching between channels is difficult, it can create a problematic shopping experience and inhibit the progression of the customer journey. For example, if a consumer has to search for an item again after switching between the retailer's website and mobile app, it adds unnecessary complexity and can disrupt the continuity of the shopping journey. Therefore, companies' decisions regarding the integration of channels can affect customers' omnichannel experience (Le and Nguyen-Le, 2021), and firms must optimize all touchpoints to provide a consistent experience for omnichannel consumers.

Shen *et al.* (2018) terms omnichannel customer experience as perceived fluency and divide it into five dimensions based on Majrashi and Hamilton (2015). The identified dimensions are task, content, interaction, cognition and feeling fluency. Parise *et al.* (2016) break the customer experience in a technology-enabled omnichannel environment into immersion, flow, cognitive fit and emotional fit. These studies diverge on the use of terminology to explain the phenomenon but converge on three main aspects, i.e. consistency of the message, continuity of the task and constancy of customers' emotional and cognitive state across channels, as shown in Table 2. We posit that based on the value in use the customers seeks from the interactions in a customer journey (e.g. utilitarian, hedonic), the enhanced flow will result in a better omnichannel experience.

Three dimensions are significant to flow experience across channels when shopping: continuity and consistency, and emotional and cognitive fit which are shown in Table 2.3. Next, we describe these dimensions in detail.

i. Continuity

Continuity refers to the seamless progression of the shopping journey across different channels, from the search and purchase phases to aftersales. This can involve switching

between channels, which can be constant, interchangeable, or simultaneous (Cocco & Demoulin, 2022). Seamlessness is achieved when customers can transition smoothly between channels that have been integrated by the retailer. This seamless movement is important because it allows customers to switch between channels easily and without interruption. For example, if a customer is unable to place an online order in a physical store, this creates a barrier to moving between channels and hinders the continuity of the customer journey. One example of continuity in a customer journey would be an online retailer introducing a new touchpoint that allows customers to more easily track their packages or to see a photo of where a package was left if they were not at home (Kuehnl et al., 2019). On the other hand, an example without continuity would be when a customer wants to order a product available online while in the store, but the retailer's physical store does not allow customers to place online orders.

ii. Consistency

Consistency in the customer experience refers to the perception of the same benefits across different channels during the shopping journey. This can facilitate a seamless experience for the customer. In an omnichannel context, consistency is achieved when the product assortment, prices, and promotions are aligned across channels. For example, if a customer sees a product priced at 100$ on the website but finds that the same product in a store is priced at 120$, this inconsistency can disrupt the customer's journey and cause confusion (Cocco & Demoulin, 2022). In terms of promotions, a good example of consistency would be where the company's same branding and logo are consistently present across different touchpoints, such as their website, stores, and delivery vans. This allows customers to easily recognize the brand and have a harmonious customer journey (Kuehnl et al., 2019).

iii. Constancy of emotional and cognitive fit

Cognitive fit refers to the availability of relevant information and expertise to customers when and where they need it (Parise et al., 2016). The availability of information considering the type of touchpoint being used should be constant irrespective of the stage of the customer journey. Attempts to improve cognitive fit in an individual touchpoint while ignoring the remaining touchpoints can lead to increased friction in the customer journey. For instance, a customer who finds a clothing retailer's social media page easy to navigate and visually appealing during the pre-purchase stage may experience frustration if they encounter slow-loading pages and unhelpful filters on the website during the purchasing process. This is a

vital issue often ignored even by retailers offering a well-designed experience(Marutschke et al., 2019). Emotional fit pertains to the availability of the same level of emotionally appealing experience for specific customer tasks at all touchpoints. For example, a customer visiting a store to purchase a gift for their loved one may appreciate a range of personalized recommendations, gift-wrapping services etc. But then, if they transit to the webshop and it lacks these features, the customer may feel a sense of disappointment or frustration.

Overall, studies show that customers who experience flow during their customer journey are more engaged and loyal (Cocco & Demoulin, 2022; Shi et al., 2020). It clearly illustrates the importance of flow experience, which is often neglected in understanding omnichannel customer behaviour in prior studies. It has two key factors: i. Reducing the risk of losing the customer during the customer journey by providing unified and integrated services and customer experience ii. encouraging the customer to proceed in the customer journey with the company by providing intuitive transitions across channels in each touchpoint to match customers' expectations.

Table 2.3 Main Dimensions of Flow Experience

Dimensions of flow experience	**Terminologies used in literature**
Consistency of the content	Consistency (Shi et al., 2020), Integration (Shi et al., 2020), Content Fluency(Shen et al., 2018), Immersion (Parise et al., 2016)
Continuity of the task	Flow(Parise et al., 2016), Connectivity (Shi et al., 2020), Task Fluency(X. L. Shen et al., 2018), Interaction Fluency (Shen et al., 2018), Interconnectivity (Chang & Li, 2022), Efficiency of migration (Chang & Li, 2022)
Constancy of emotional and cognitive fit	Cognitive Fit (Parise et al., 2016), Emotional Fit (Parise et al., 2016), Cognition Fluency (X. L. Shen et al., 2018), Feeling Fluency (X. L. Shen et al., 2018), Personalization(S. Shi et al., 2020), flexibility(S. Shi et al., 2020)

2.1.3. Measuring Flow Experience

Measuring flow experience is essential for companies to understand and meet their customers' needs and improve customer loyalty and drive business success. The current methods that measure different aspects of customer experience, such as net promotor score and customer satisfaction, do not fully capture the complexity of modern customer

touchpoints. As customer touchpoints are increasingly multi-channel, interconnected, time-based and dynamic, customer interactions can happen across multiple channels and touchpoints, are interrelated and can change over time. Therefore, customer feedback collected by these common methods does not fully capture the entire customer journey and experience, particularly the flow experience. The customer experience encompasses all interactions and touchpoints that the customer has with the company. It starts from the initial awareness of the company and its offerings, to the evaluation and consideration of those offerings, to the actual purchase and use of the product or service, and finally to post-purchase evaluation and loyalty (Godovykh & Tasci, 2020). The current measurement tools being used are useful for evaluating the perceived quality of specific interactions with a company, such as visiting a website or making a service call. However, they may not be effective at understanding how well these interactions are connected over time to create a flow experience. This can lead to a one-size-fits-all approach to customer satisfaction and loyalty, despite research suggesting that this may not be the best approach (Marutschke et al., 2019). Recent research on retail and customer experience has highlighted the crucial role of the transition between touchpoints in shaping the overall shopping experience. To accurately evaluate and improve the customer experience, it is imperative to develop specific measurements that capture the intricacies of this critical aspect (Chang & Li, 2022).

In the current literature, there are some approaches suggested for evaluating flow experience. For example, Godovykh and Tasci (2020) suggest evaluation based on three elements: ease of use, fluidity of movement between channels, and the perception of barriers or obstacles. Other methods suggested include end-to-end experience score (EEC), seamless experience score (SES), and customer effort score (CES). EEC measures the overall satisfaction of customers across their customer journey, while SES focuses on delivering consistent experiential stimuli and the ability to trace transactions across an omnichannel experience. CES assesses the effort required by a customer to complete a task or interaction with a company.

It is essential for retailers to not just measure it but also take design action based on the insights gained to continuously improve the flow experience. The link between design and assessment needs to be established. This gap has been addressed in the design artefact for this study, shown in Chapter 5.

2.2. Omnichannel Retail Design

The field of marketing is the main driver behind the development of the omnichannel retail design. However, the primary area of investigation in omnichannel retail design is how advancements in information and communication technologies (ICT) have impacted retail and consumer behaviour. Thus, the relevant literature is present in both marketing and IS disciplines. Current literature on omnichannel retail has covered various topics related to both retailers' actions and customers' responses. Retailer-centric research has primarily explored the integration of different channels and optimization of channel mix. In contrast, customer-centric research has focused on customer satisfaction, service quality, and touchpoints. This study delves into two critical areas of research in this context: channel integration and the transformation of interaction touchpoints, which will be further explained in the following sections.

2.2.1. Channel Integration

Channel integration is the most significant characteristic of omnichannel retailing (Lewis et al., 2014). Channel integration has been shown to have a positive effect on customer experience and acts as a competitive advantage for retailers (Herhausen et al., 2015), which leads to stronger sales growth (Cao and Li, 2015), an increase in the "perceived quality of the channels" (Lemon and Verhoef, 2016) and the reduction of service inconsistencies (Yan et al., 2010). Additionally, channel integration can achieve synergies such as "improved customer trust, improved customer awareness, consumer risk reduction, and coverage of diverse shopping preferences" (Heuchert et al., 2018). Furthermore, it allows retailers to actively maintain customer contact and develop a proactive customer experience management strategy through increased customer insights (Yan, Wang and Zhou, 2010). Finally, the interconnection of channels makes it harder for competitors to imitate the company. It could increase the customer's value proposition and thus reduces the competitive pressure (Heuchert et al., 2018).

Technology implementation for channel integration is a significant undertaking because of the constantly evolving capabilities to drive the integration (Yan et al., 2010). Retailers trying to adopt these technologies for channel integration can easily get lost in the variety of technologies to choose from (Willems et al., 2017). Consequently, they often select technologies without examining the potential contributions to their strategies (Inman &

Nikolova, 2017). Extant literature on channel integration addressing the issues of technology implementation or technology capabilities in retail has mainly focused on the use of some specific technologies such as RFID (Angeles, 2016, 2018), augmented reality (Hilken et al., 2018), beacons (Pierdicca et al., 2015), mobile technologies (Vazquez et al., 2017; Mladenow et al., 2018) etc. The literature which studies multiple technologies has either focused on physical stores or online shops. For example, Mosquera et al. (2018) examine the intention of customers in using the fitting room and in-store technologies in an omnichannel physical store. Similarly, El Azhari and Bennett (2015) and Blázquez (2014) investigated the use of in-store digital technologies in order to enhance the customer experience in retail stores. Mladenow et al. (2018) identify aspects of omnichannel retailing that mobile technologies can affect, while Angeles (2016) and Angeles (2018) studied the use of RFID as an enabler for channel integration. But a clear and comprehensive picture of the digital technologies that may be adopted to create value through different aspects of channel integration and their respective roles have yet to be revealed (Rossignoli et al., 2018). For omnichannel retailing to be effective and efficient, multiple channel integration activities play a pivotal role. These channel integration activities are identified through a literature review. The results of this literature review are then combined with results from the industry best practices and the case study with IR. These are presented in Section 4.5.

2.2.2. Transformation of Interaction Touchpoints

The term "touchpoints" in retail refers to the points of interaction between a retailer and customers throughout their journey, including activities like information gathering, payment, and after-sales services (Boak, 2021; Kuehnl et al., 2019). These touchpoints are critical to experience formation as without actual or imagined interactions, there can be no customer experience. Touchpoints differ based on their control, nature, and stage in the customer journey. Control of touchpoints refers to who is responsible for managing the interactions. Some touchpoints are controlled by the retailers, such as the store environment, corporate website, advertising, and employees. The customer or other brands or firms primarily control other touchpoints. (Kranzbühler et al., 2018; Lemon & Verhoef, 2016). Most of the research has focused on retailer-controlled touchpoints. Still, there is growing recognition of the significance of touchpoints that are not under the retailer's control, particularly the role of other customers and third-party firms in creating a good customer experience. However, further research is still needed before a widespread understanding and acceptance of the importance of non-retailer-controlled touchpoints.

Retail touchpoints have undergone a dramatic change which opened up new avenues for retailers and customers with regard to their interactions (Straker et al., 2015). It also provides retailers with opportunities to analyse and influence these interactions (Iftikhar & Khan, 2020). Technological developments have changed shoppers' in-store behaviour, and preferences as customers are exposed to a multitude of technologies in today's physical stores (Betzing et al., 2018). Retailers are offering their products and services through an ever-increasing number of touchpoints (Seck & Philippe, 2013). While traditional retailing primarily deals with retail channels (firm-controlled touchpoints) in a dyadic interaction (between retailers and customers), omnichannel retailing accentuates the interactions among the customers, products (brands), retailers, machines and other retail touchpoints (Kranzbühler et al., 2018). Retail touchpoints can be part of the purchase, pre-and post-purchase part of the customer journey and may develop across various retail channels (Meyer & Schwager, 2007; Zomerdijk & Voss, 2010).

In the extant literature, omnichannel retail touchpoints have been classified based on various parameters, including their medium, functionality, type of interaction, human/non-human contact, and level of interaction. Vannucci and Pantano (2019) classified touchpoints into human and digital touchpoints. Loshin and Reifer (2013) described touchpoints based on the type of interaction they facilitate. Straker et al. (2015) formed a typology of digital touchpoints based on the purpose and direction of the interaction. Table 2.4 exhibits a subset of the existing retail touchpoints and emphasizes that retailers and customers now have the opportunity to use a wide range of digital means to interact with each other at different stages of the customer journey. The nature and level of interactions vary across each touchpoint, which facilitates the personalization of interactions for each customer. Still, on the other hand, it also makes the design of interactions a lot more complex. For this research, we have categorized touchpoints into three categories based on the level of interaction: Interpersonal (high level of interaction), Hybrid (low level of interaction) and Informational/Brand Visibility (No direct interaction). Furthermore, we also included the type and purpose of interaction along with a type of ownership for the classification of touchpoints as it plays an important role in customer experience design.

Table 2.4 Examples of touchpoints in omnichannel retail

Touchpoints	**Touchpoint Category**	**Example of Interaction**	**Type of Interaction**	**Nature of Interaction**	**Controller of contact Points**
Website	Hybrid	Browsing for information	Customers to retailers (Non-Human)	Communicative	Firm-controlled
Augmented Reality App	Hybrid	Observing products in an alternative environment	Customer to Products	Informative	Firm-controlled / Third-party controlled
Self-service kiosks	Hybrid	Interaction with touch screen	Customers to retailers (Non-Human)	Purchase/ Revenue	Firm-controlled
Live Chat	Interpersonal	Engaging with an agent virtually	Customers to retailers (Human)	Support, Communicative	Firm-controlled
Web Enquiry	Hybrid	Filling a form for information	Customers to retailers (Non-Human)	Communicative	Firm-controlled
E-News Letters	Hybrid	Marketing email with new products	Customers to retailers (Non-Human)	Informative/ Promotion	Firm-controlled
Digital Loyalty Programs	Hybrid	Log in using your credential on the retailer's website	Customers to retailers (Non-Human)	Informative/ Promotion	Firm-controlled / Third-party controlled
Product Reviews	Hybrid	Writing a review of your purchase	Customers to retailers (Non-Human)	Informative	Third-party controlled
Brand Signage	Informational/Brand visibility	Seeing an advertisement	Customers to retailers (Non-Human)	Informative	Firm-controlled
Instagram/Facebook	Hybrid	Expression your opinion	Customer to Customers	Communicative/ Informative	Third-party controlled

Employee	Interpersonal	Asking for advice	Customer to Retailer (Human)	Communicative	Firm-controlled
Digital Showroom	Hybrid	Trying on products virtually	Customer to Products	Support	Firm-controlled
Beacons	Hybrid	Receiving promotions on mobile when shopping in-store	Machine to machine	Informative/promotion	Firm-controlled / Third-party controlled

Brand Visibility/Informational touchpoints are those that expose customers to the brand without any direct interaction, such as advertisements, product packaging or brand signage. These touchpoints mostly refer to the instances when a customer is passively exposed to the brand without actively seeking it out. This includes situations such as seeing a brand's logo on a billboard or coming across a brand's social media page while browsing. These touchpoints are significant because they provide customers with an initial impression of the brand, even before they have engaged with the brand in any meaningful way (Hickman et al., 2019).

On the other hand, interpersonal touchpoints involve direct interaction between the customer and the retailer representatives, such as face-to-face in-store visits or phone calls. These touchpoints are significant because they provide an opportunity for the retailer to establish a relationship with the customer and create a personal connection. Furthermore, these touchpoints allow customers to receive more personalized and tailored information about the brand and its products. Interpersonal touchpoints, which refer to face-to-face interactions with employees or representatives of the retailer, have been widely studied in the literature as a critical component of customer experience. For example, research has shown that customer satisfaction and loyalty are positively influenced by the quality of interpersonal interactions (Cowan et al., 2021).

The third category, hybrid touchpoints, refers to instances when customers engage with the brand through digital technologies and do not directly interact with another person but

involve interaction with the retailer at some level. This includes touchpoints such as mobile apps, augmented reality experiences, email marketing, chatbots, and other digital interactions. These touchpoints are significant because they provide customers with an additional channel through which they can engage with the brand and offer the brand an opportunity to reach customers who are already active.

2.3. Service Design

Service design deals with the orchestration of various service components, including the physical environment, customers and employees, and service delivery processes (Mattelmäki et al., 2018). This discipline focuses on creating new services or improving existing ones and aims to facilitate customers in co-creating the experiences they desire (Boak, 2021). Service Design involves a human-centred approach, incorporating Interaction Design using specific design-based techniques which are discussed in detail in the following sub-sections.

2.3.1. Customer-Retailer Interaction Design

Retailers cannot explicitly design or control all customer interactions for better customer experiences, as customer experiences are subjective. However, they can design and manage touchpoints within the omnichannel interaction system in order to influence the customer experience (Ponsignon et al., 2017). There have been several studies on how to design technology-enabled interactions. These studies have explored the challenges in designing design technology-enabled interactions and proposed various approaches to addressing these challenges (Teixeira et al., 2017). Interaction design refers to the process of making choices regarding the interactions at multiple touchpoints that occur between a retailer and the customer. It involves coordinating tangible and intangible aspects of the omnichannel interaction system, such as physical environments, employees, customers, and service processes. Interaction design aims to empower customers to co-create their desired experiences through their interactions with the retailer (Boak, 2021).

Early work on the encounters between retailers and customers was focused on face-to-face interaction between retail employees and customers (Czepiel, 1990). However, with the advancement of technologies, the focus was broadened. The more recent approach to customer-retailer interactions encompasses all the moments when customers interact with any retail interface. The retail interface refers to people (i.e., employees), the physical

environment, service processes, and technology (Patrício et al., 2011). Interaction between retailers and customers, believed to be one of the most important factors influencing customer experience, has moved from a dyadic viewpoint to a dynamic one (Zomerdijk & Voss, 2010). Taking this dynamic perspective of customer experience, Teixeira et al. (2012) advocate for abandoning the dyadic view of the interactions and argue that interactions occur within a broader network consisting of customers, retailers, third-party technology providers, other customers, and products. Most retailers still design an interaction landscape considering just their own channels and touchpoints; other customers and third-party service providers are often outside the scope (Hollebeek et al., 2022). However, in the technology-enabled retail of today, customers learn about the details of the offerings as they advance along their customer journey. This brings them to different third-party touchpoints or interaction platforms where they engage with other customers. This increases the complexity of customers' journeys while reducing retailers' control over their interaction with customers (Roy et al., 2017).

In the service design literature, customer activities play a crucial role in comprehending the customers' interactions with the service system and the reasons behind their behaviour. It is imperative to identify the various activities that a customer engages in throughout the customer journey. The impact of customer experience is not only determined by the elements with which the customer interacts but also by how the interaction takes place and the customer's goals or desires. For example, a customer who is excitedly anticipating a vacation while arriving at the airport may have a very different mindset than a customer leaving home after an extended journey (Boak, 2021).

Roth and Menor's (2003) research delineated three fundamental types of service design decisions, namely structural, infrastructural, and integration choices, depicted in Figure 2.3. The structural design choices refer to the tangible elements of the system, such as facilities, technology, equipment, aesthetics, and ease of navigation, that shape the customer's anticipated responses. Infrastructural design choices encompass the long-term decisions that govern the organizational processes, policies, and behaviours, including the company's values and objectives. The integration design choices centre on coordination at both external and internal levels, involving the development and preservation of customer relationships and organizational knowledge as an intellectual asset. These design categories have a direct impact on the actual service delivery system, its implementation, and the customer's

perceived value of the overall service concept. Although Roth and Menor's (2003) design framework considers the customer's perceived value, it does not account for the customer's interactions at touchpoints or the effects of their involvement with the omnichannel interaction system on their experiences at a multi-dimensional level, encompassing emotional, cognitive, sensorial, social, and physical factors.

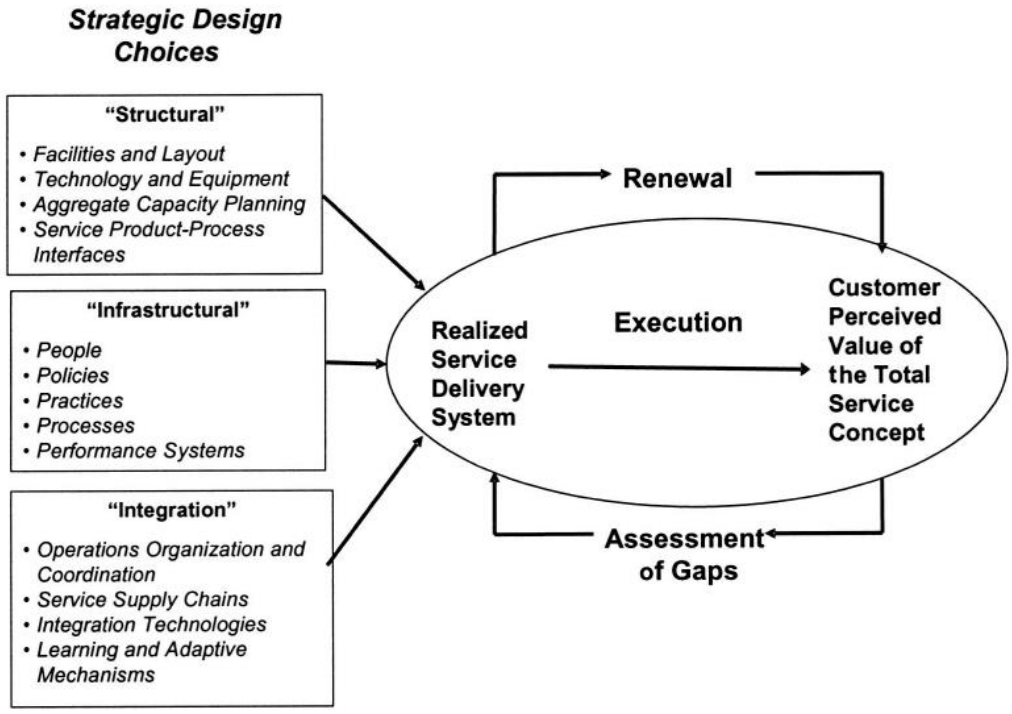


Figure 2.3 Architecture for Service Delivery Systems (Roth and Menor, 2003)

Voss et al. (2008) extended the design framework of Roth and Menor (2003) by adding a fourth design choice called "customerware." This design element concentrates on the design and management of touchpoint interactions, which encompass all direct and indirect points of contact between the customer and the service delivery system, as well as peripheral services that exist outside of the core service offering. This augmentation to the model underscores the significance of touchpoint interactions in creating a positive customer experience and highlights the importance of managing these interactions as part of the overall service design process.

Verhoef et al. (2009) developed a customer experience conceptual model shown in figure 2.4, including past experience. Including past customer experiences is essential when considering the customer's current experiences, as customer experience can change and evolve over time. This is important for making customer experience design decisions, as

customers' perceptions and priorities may vary throughout their overall journey (Verhoef et al., 2009).

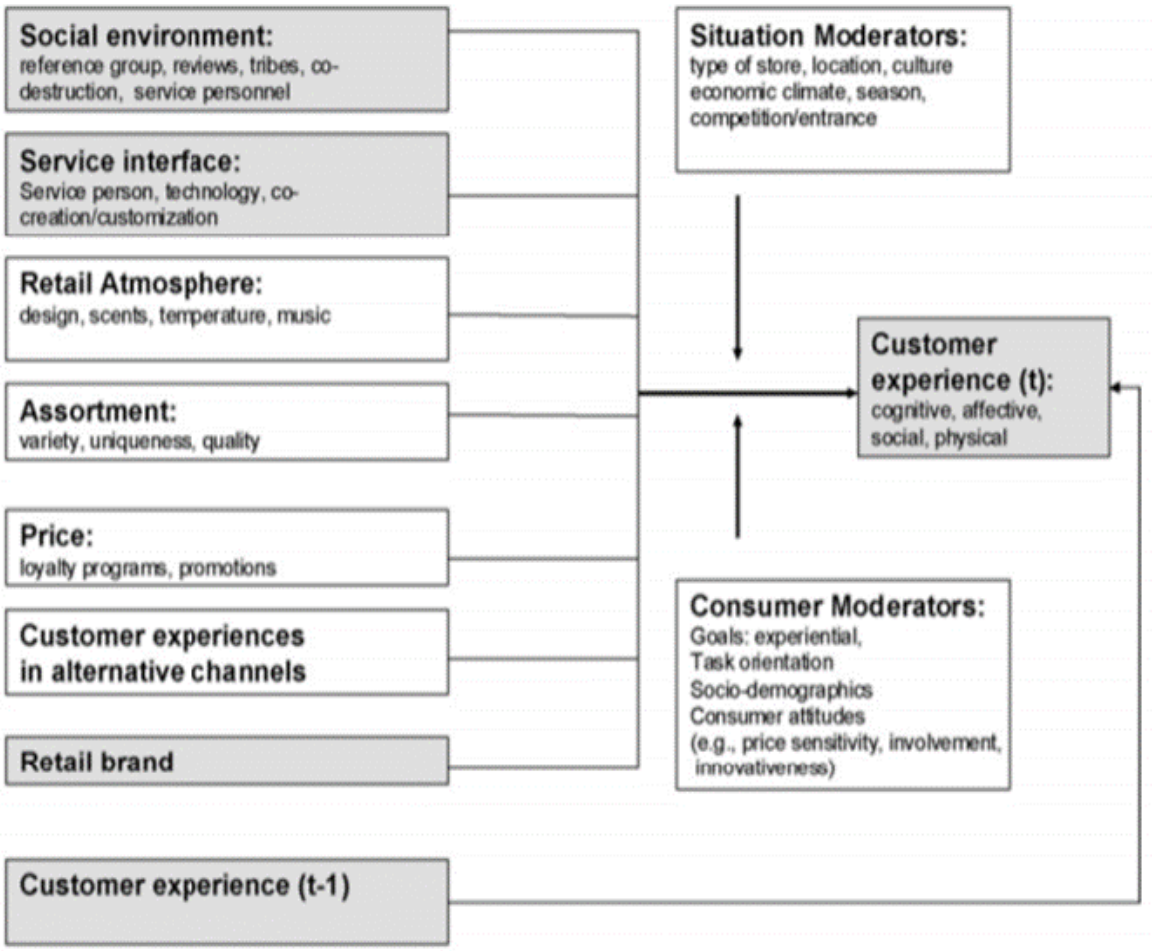


Figure 2.4. Conceptual Model for Customer Experience Creation (Voss et al. 2008)

Nöjd et al. (2020) used the concept of valuescape to explain the landscape of factors that influence interaction and grouped them into three main categories: drivers for customer interaction, arenas, and the role of digital technology. The drivers for customer interaction refer to the motivations and goals that drive customers to interact with a company or brand. These can include the desire to fulfil a specific need or want, to establish or maintain relationships with the company or its employees, or to have a positive or meaningful experience with the company. The arenas refer to the environments or contexts in which customer interactions occur. These can include the physical venue where the interaction occurs (e.g., a store, website, or app), as well as the broader social, cultural, or economic context in which the interaction takes place (referred to as the "milieu"). The role of digital technology refers to the ways in which technology is used to facilitate customer interactions

and the co-creation of value. This can include the practical usability of the technology (e.g., how easy it is to use), as well as the extent to which the technology is intrusive or disrupts the customer experience. When understood together, these drivers, arenas, and the role of digital technology can be considered a "Valuescape," which refers to the complex landscape of factors that influence the value that customers co-create with a retailer.

Mele and Russo-Spena (2021) concentrated on how organizations can leverage smart technologies to configure the architecture of a phygital customer journey. Employing a qualitative method that utilized a grounded theory approach, the study engaged key players in digital customer solutions and service providers from various industries. The findings revealed that the architecture of the phygital customer journey, presented in Figure 2.5, results from the interplay between systems of insights and systems of engagement triggered by multiple customer-provider interactions in a fusion of physical and digital contexts. The research underscores the need for companies to adopt a blended approach to bridge disconnected contexts, exploit novel opportunities, and cultivate customer engagement throughout the entirety of the customer journey.

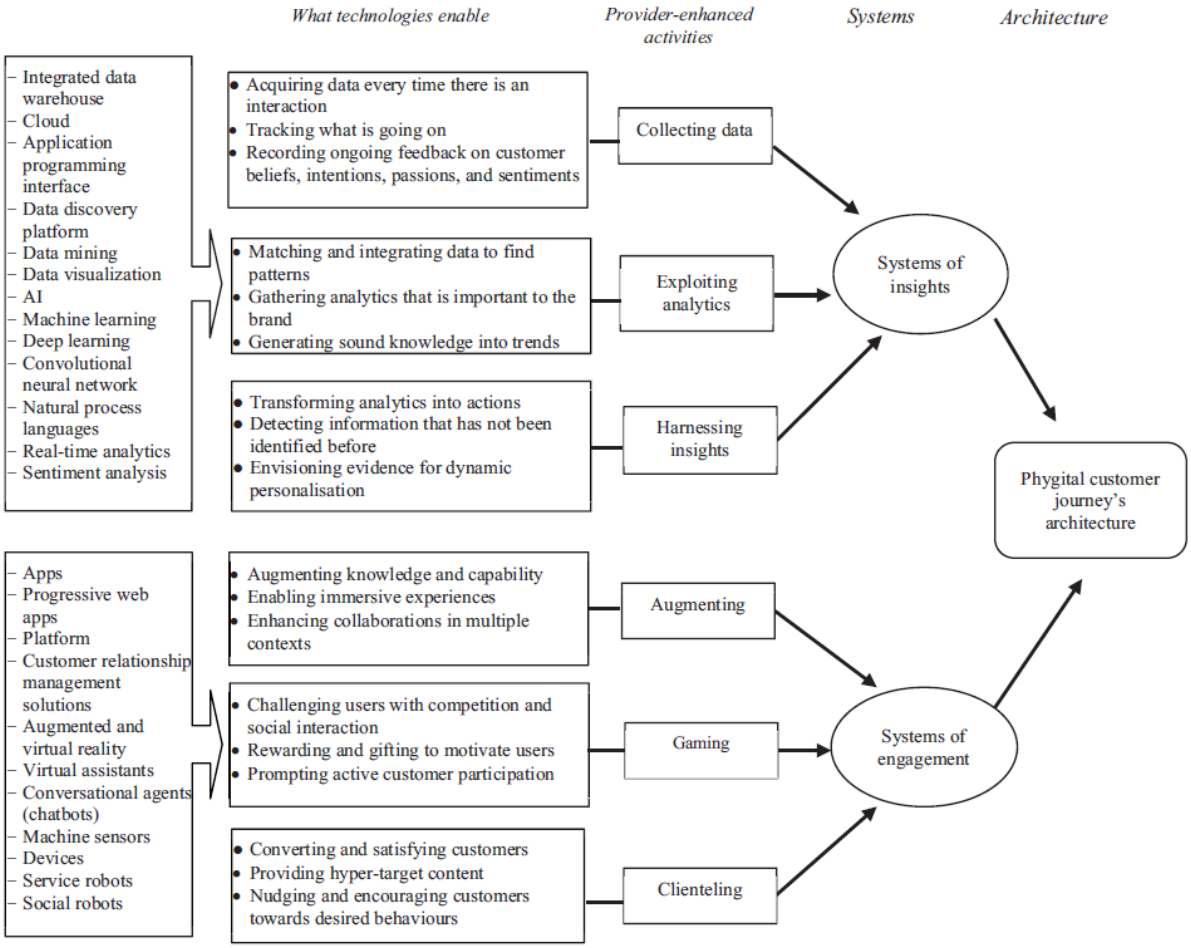


Figure 2.5. Design of Phygital Journey Architecture (Mele and Russo-Spena 2021)

2.3.2. Limitations of Existing Frameworks/Models

Existing interaction design models and frameworks within the service design discipline do not completely encompass the multi-faceted nature of the omnichannel customer journey and experience. Although these models allow a better understanding of the factors that influence some aspects of the flow experience, they do not comprehensively comprehend the cognitive, emotional and social components. They also do not explain how these elements are linked to the interactions between the customer and the service provider within the servicescape (which includes built, natural, social, and digital components). Customer interaction design models such as service blueprint (Bitner et al., 2008) or customer journey maps (Rosenbaum et al., 2017) usually focus on the customer journey steps that customers go through in the retailer-controlled touchpoints (Trischler & Westman Trischler, 2021). With customers in their shopping journey being enabled by different technologies, the

retailer can directly control only a part of the overall customer experience. The retailers also need to consider how their service design accounts for third party touchpoints and technologies and also what is the effect of the newly designed interactions on other customers i.e. customer-customer interactions (Pantano et al., 2018). Design studies such as Artusi and Bellini (2020) only focus on the perspective of the retailer delivering the service and do not consider the benefits for customers. In order to improve the design for customers, there is a need for studies that integrate the design with how customers perceive and experience services that offer something beyond traditional products or services. Some of the extant design methods in the literature, such as the multilevel service design method, do consider the user's navigation process and structure. Still, they do not effectively address the integration of design elements related to technology-enabled interactions, including infrastructure design and assessment design, particularly in the retail industry (Tuunanen et al., 2022). These methods also lack support for contextualization in different organizational settings. Therefore, there is a need for a more comprehensive approach to designing technology-enabled interactions that consider all relevant design elements and is applicable in the retail industry.

To fill this gap, we propose a model based on the literature review and a case study with an omnichannel retailer, which considers external factors in designing interactions. Vrontis et al. (2017) and Kranzbühler et al. (2018) have proposed the integration of both customers' and retailers' perspectives in modelling customer experience. Vrontis et al. (2017) specified retailing-influencing communities as significant factors contributing to technology-enabled retailing and the design of retailing interactions. Kranzbühler et al. (2018) argue that retailers must evaluate the entire service network to understand the customers' perspectives and needs before designing their interactions. These studies serve as a solid foundation to investigate customer interactions from the perspective of retailers and customers and propose a model for designing retail interactions to improve customer experience in omnichannel retail.

2.4. Supporting Theories and Frameworks

This section introduces the relevant frameworks, kernel, and design theories that form the foundation of the proposed design in this research. These theories and frameworks provide a comprehensive understanding and guide the design process.

2.4.1. Activity Theory

Activity theory, with origins in psychology, provides a framework for comprehending human behaviour and the connections between individuals and their environment (Engeström, 1999). According to this theory, all human experiences are influenced by the tools and systems used, indicating a strong emphasis on mediation (Boak, 2021). The concept of activity theory has been applied in numerous areas, such as education, information systems, and human-computer interaction, to understand how individuals interact with technology and create effective technology interfaces to support users' objectives and activities (Allen et al., 2013). Activity theory considers a variety of relationships, with the primary focus being on the interplay between the subject and object of activity mediated by tools.

There are several approaches to using activity theory. For example, the utilization of an activity checklist for human-computer interaction design (Kaptelinin et al., 1999), explaining the technology-mediated change in the organization (Allen et al., 2013), online learning environments (Barab et al., 2004) and user-centred design (Good & Omisade, 2019). Within the omnichannel context of this study, it underpins the development of the synergies created using different technologies, channels, and touchpoints alongside unique characteristics of consumers to create meaningful and unique experiences.

2.4.2. Social Exchange Theory

Blau's social exchange theory proposes that individuals are motivated to reciprocate benefits received from others (Blau, 1964). Individuals in positive and high-quality relationships are more likely to engage in behaviours that benefit their exchange partner and are willing to exert more effort to do so (Blau, 1964). Gazzoli et al. (2013) suggest that employees who experience high levels of job satisfaction and empowerment can positively impact the quality of interactions and services they provide, ultimately leading to enhanced customer experience (Heska, 2009). In service contexts with high emotional intensity, such as healthcare, employees' emotions can influence the quality of customer experience and potentially trigger emotional contagion effects (McColl-Kennedy et al., 2017).

2.4.3. Multilevel Service Design

This study utilized the MSD (multilevel service design) approach (Patrício et al., 2011) and an extension of this approach in the MINDS (management and interaction design for service) method (Teixeira et al., 2017) as the foundational design theories.

MSD is an interdisciplinary approach that enables the integrated development of service offerings at three hierarchical levels: designing the firm's service concept, designing the firm's service system, and designing each service encounter. It is a relatively new design theory in the field of service design that aims to enhance service quality by integrating both management and interaction design perspectives (Teixeira et al., 2017). Collaboration among different stakeholders, such as service providers, customers, and other parties involved in the service delivery process, is highly emphasized in this method. This method strongly emphasises the importance of understanding the service context and identifying the critical moments of the service journey to improve the overall service experience.

Considering the research's focus on designing technology-enabled interactions across multiple channels and touchpoints, these two approaches (MSD and MINDS) provide a strong starting point for the design. The integrated approach of MSD and the customer-centric approach of MINDS are well-suited to handle the complexity of designing interactions across various channels and touchpoints, thereby contributing to the development of the "Omniflow Framework" explained in Chapter 5.

2.4.4. Information Architecture

Various descriptions of Information architecture (IA) can be found in the literature, each with its respective proponents. While some definitions of IA are narrow and focused, others are all-encompassing. However, most IA definitions share common characteristics that emphasize the attributes, structures, and interrelationships among information assets (thesis). In the context of interaction design, IA is considered to be concerned with the structural design of information spaces (Lacerda et al., 2019). To address our specific purpose of information exchange, we have adapted the definition of IA from Tan et al. (2013) and Xie et al. (2012). They define IA as supportive of information exchange processes (Xie et al., 2012) and ensuring that information is presented in the right context and with the right content (Tan et al., 2013). Based on these, IA is defined as

"An architectural approach aimed at identifying major information categories and their relationships to other components that supports the information exchange processes to provide information with the right content and in the right context."

IA is concerned with static information structure organization and includes a dynamic process-centric view of mapping and visualizing information flow. Although IA has long been associated with website design in the field of user experience, the role of IA has been redefined in recent years. This reframing originates with Resmini and Rosati (2011), who introduced the concept of pervasive IA as the medium-aspecific design of digital/physical information spaces. As the number of channels available to customers in retailing grows, methods must be developed to design successful transitions between channels (Resmini & Rosati, 2011). By ensuring consistency and meaning in interactions across channels, pervasive IA can help to maintain successful cross-channel experiences (Benyon & Resmini, 2017).

For omnichannel retailers, IA can enable the creation of successful cross-channel encounter designs (Fisher et al., 2012). Recent studies also support this assumption. For example, Burford and Resmini (2017) found that information coherence and cross-channel experience are the two most essential aspects of omnichannel experience design. Information Foraging Theory further supports the concept of IA influencing cross-channel customer experiences (Pirolli, 2007). Without a well-defined information environment, meaning can break down with each channel transition, ultimately resulting in poor cross-channel user experience. Therefore, effective IA ensures semantic proximity between items belonging to different channels but connected to the same task, process, or people.

2.5. Knowledge Gap Analysis

Despite a significant increase in recent studies on omnichannel customer experience, as shown in Table 2.5, we still do not understand how new developments in interactions enabled by emerging technologies influence customer experience when they transition from one channel to another. There has been little scholarly research on understanding different dimensions of omnichannel customer experience (e.g., flow, perceived fluency) facilitated by innovative technologies (Roy et al., 2017). The focus of customer experience research in the past has often been on understanding, measuring and optimizing the customer experience in different channels. The contribution of interactions through multiple touchpoints to the

customer experience is still a neglected area in retailing research (Lemon & Verhoef, 2016). Most research has been about ensuring that the moments when the customer is "in the channel" are perceived as being excellent. But what happens when customers move from one channel to another has received less attention. While extant literature has highlighted the importance of managing touchpoints along the customer journey and its overall perception by consumers, this issue has received scant research attention (Kuehnl et al., 2019). Designing customer interactions involving multiple channels and touchpoints requires design frameworks that include all the critical omnichannel customer experience-related elements and their relationships. We argue that the focus on creating customer experience in different channels and not focusing on the cross-channel experience limits the usefulness of omnichannel retailing.

Table 2.5 demonstrates the result of the literature review showing analysed studies that focused on the effect of customer interactions on retail customer experience. These studies cover a range of customer experience aspects in terms of customer interactions such as customer-employee interaction (Lee, 2015), service design (Larivière et al., 2017; Voorhees et al., 2017; Zomerdijk & Voss, 2010), technology-enabled customer interactions (Cruz et al., 2018; Hilken et al., 2018; Parise et al., 2016), customer interaction management (Cambra-Fierro et al., 2018; Chen et al., 2017), and customer interaction modelling (Grenha Teixeira et al., 2017; Teixeira et al., 2012). These studies, with some exceptions such as Kranzbühler et al. (2018) and Vrontis et al. (2017), have focused on either the customer or the organization's perspective in understanding, designing or enhancing customer experience. Both these perspectives are vital, but reference models or frameworks that combine both perspectives for interaction design are missing.

Table 2.5. Representative studies on customer interaction and experience

Representative Studies	**Study Focus**	**Study Type**	**Study Setting**	**Perspective of Study**	**Insights**
Ramani and Kumar (2008)	Identification of the antecedents of interaction orientation and its effect on the performance	Empirical	Customer Interaction Management	Organization	Relationship building with customer and profit performance are not related to each other.

Zomerdijk and Voss (2010)	Set of propositions for experience design based on literature	Empirical	Service Design	Organization	Proposed six different design principles including designing from the customer journey and managing the presence of fellow customers.
Teixeira et al. (2012)	Development of customer experience model for service design.	Conceptual	Service Design	Organization	The proposed customer experience management structure allows designers to pinpoint the effect of design changes from the overall service level to just one moment of interaction.
Seck and Philippe (2013)	Explored effect of customer's interaction in physical and virtual channels on customer satisfaction	Empirical	Service Design	Customer	Customer satisfaction depends not only on interactions in all channels used but also on the integration between channels.
Lee (2015)	Effect of consumer-to-store employee and consumer-to-self-service technology interaction qualities on consumer retail patronage.	Empirical	Customer-Employee Interaction	Customer	Establishes a direct link from self-service technologies usage frequency to the perception of their service quality.

Stein and Ramaseshan (2016)	Identification of customer touchpoint elements that influence the customer experience in multi-channel retail contexts.	Empirical	Customer Interaction Management	Customer	The study provides a holistic understanding of the touchpoints and a classification of different types of touchpoints.
Melero et al. (2016)	Key issues in the management of touchpoints across all channels in an integrated manner.	Conceptual	Customer Interaction Modelling	Customer	Firms must adopt a customer-centric approach, delivering personalized customer experiences and redefining the role of the physical store and embracing mobile marketing.
Roy et al. (2017)	Constituents and key dimensions of smart customer experience.	Empirical	Technology-enabled Customer Interaction	Customer	Smart customer experience consists of relative advantage, perceived enjoyment, personalization, perceived control, and interactivity
Vrontis et al. (2017)	Value-based analysis of B2C relationship in a smart retailing context.	Conceptual	Technology-enabled Customer Interaction	Customer and Organization	Through smart technologies and social networks, retailers have 'invaded' consumers' lives, but correspondingly, consumers have 'invaded' retailers

					marketing processes due to their use of these technologies.
Kranzbühler et al. (2018)	Classification and examination of customer experience from customer and organizational perspective	Conceptual	Customer Interaction Management	Customer and Organization	Proposed that a combination of insights from the retailer as well as customer perspective can help the retailer to effectively manage customer experience.
Kumar et al. (2019)	Developed a framework to ensure customer engagement in services by adopting a customer-centric approach.	Conceptual	Customer Interaction Modelling	Customer	Types of the market can influence factors that lead to a positive service experience.
Koetz (2019)	Case study of the retailer "Sephora" for identification of the best practices in customer experience management	Empirical	Customer Interaction Management	Organization	Sephora's strategy is based on blended in-store and digital experiences to trigger a positive emotional response in social shopping dynamics.
Kuehnl et al. (2019)	Identification of value drivers of customer experiences and effective customer journey design.	Empirical	Customer Interaction Management	Customer	An effective customer journey strongly affects utilitarian brand attitudes, while brand experience influences hedonic brand attitudes.

(Ameen et al., 2020)	Proposed a theoretical model to capture omnichannel customer experience in shopping malls	Empirical	Technology-enabled Customer Interaction	Customer	In smart shopping malls, physical environment interactions and customer-customer interactions affect customer experience significantly.
(Tran et al., 2021)	Impact of chatbots on customers' sentiment towards human agents and chatbots	Empirical	Technology-enabled Customer Interaction	Customer	The customer sentiment towards online human agents becomes more negative after the implementation of a chatbot by the retailer.
(Moore et al., 2022)	Customers' interactions with conversational AI agents as part of the in-store shopping experience.	Empirical	Technology-enabled Customer Interaction	Customer	Customers show diverse and contrasting responses in terms of their need to get or avoid human interaction when interacting with conversational AI systems.

2.6. Summary

The chapter presents a literature review on customer experience, service design, and omnichannel retail design in the context of technology-enabled interaction design. The review brings together the marketing, service management and information systems literature. This chapter serves three distinct purposes. It presents a comprehensive state-of-the-art overview of the research topic, highlighting the gaps. Second, it draws on the existing literature to identify fundamental principles and best practices for designing technology-enabled interactions that can facilitate flow experience. Third, it provides valuable input for

the development of the researcher's own design, drawing on the insights and findings from previous research to inform the creation of the artefact.

This chapter offers a synthesis of the existing (fragmented) accounts of flow experience and highlights the existing conflicts and different perspectives. The review states that customer experience results from interactions across various touchpoints, which form their overall perception of the retailer. It is suggested that flow experience is influenced by both direct and indirect interactions with a company's touchpoints. The review discusses the importance of channel integration in omnichannel retail and the role of technology in shaping it. It also provides an overview of the kernel and design theories that support the creation of the artefact. Overall, this chapter serves as a bedrock for the design and implementation discussed in the subsequent chapters.

Chapter 3

Research Methodology

Doctoral students are required to make an original knowledge contribution and justify the methods and strategies used to come up with a particular contribution. There needs to be a strong underpinning of the contribution in research design and research methods applied. It is difficult to assess the contribution of the study if its validity and reliability cannot be ascertained (Saunders et al., 2009). Thus, the following text reflects on the philosophical assumptions of the research, choice of methodology, data collection methods and data analysis techniques adopted in this research. This chapter provides a brief overview of different research methodologies relevant to this research and explains why the design science research methodology was chosen for this study. The chapter provides more information on the design science research methodology and its steps, as well as the data collection and analysis methods used in the research.

3.1. Philosophical Assumptions

Research can be described as an improvement of knowledge and understanding of the subject matter researched by employing a logical process to collect and analyse the data (Creswell & Poth, 2017). The research philosophy adopted in research encompasses assumptions about the researcher's worldview. These assumptions underpin the choice of research strategy, methodology, and methods (Saunders et al., 2009). Three main aspects distinguish a research process: ontology, epistemology and methodology (Guba et al., 1994; Saunders et al., 2009).

Ontological assumptions in a study state the nature of reality, e.g. what is real and what is not, what is fundamental and what is derived according to the researcher (Creswell & Poth, 2017; Vaishnavi & Kuechler, 2015). Objectivism and subjectivism are two opposite strains of ontology (Holden & Lynch, 2004). Objectivist studies focus on the explanation of phenomena, whereas subjectivist studies emphasise understanding (Creswell & Poth, 2017). For the study of customer-retailer interactions (the main focus of this research), the

researcher deems it more appropriate to focus on details and understanding of the situation. This view is based on subjectivism, which claims to understand the meanings that individuals attach to a phenomenon (Saunders et al., 2009).

Epistemology deals with how the nature of knowledge is explored, for example, on what knowledge depends on and how we can be certain of what we know (Vaishnavi & Kuechler, 2015). Interpretivism and positivism are two of the most common epistemologies considered in management research.

An interpretive epistemology is in line with subjective ontology. Interpretivist studies investigate the subjective meanings motivating the actions of social actors in order to understand these actions (Holden & Lynch, 2004). Business situations such as customer-retailer interactions are not only unique but also complex (Lemon & Verhoef, 2016). Correctly understanding these situations requires investigating particular circumstances and individuals coming together at a specific time (Saunders et al., 2009). Interpretivism implies that the researcher and the people who are the subjects of the research study are interconnected and influence each other through interactions (Leitch et al., 2010). Thus, the researcher pursues to understand the context or setting of the participants through gathering information personally. The researcher also interprets findings and shapes the interpretation through personal and professional experience and background. An interpretive epistemology is consequently aligned with the research methods and techniques chosen for this research.

3.2. Main Research Paradigms

Two main paradigms exist in disciplines that deal with digital technologies' design, use, and management (Gregor & Hevner, 2013). These are behavioural science and design science. Behavioural science research uses natural science methods to develop and justify theories that explain or predict human and organizational phenomena related to the analysis, design, implementation, and use of digital technologies (Hevner et al., 2004). This research approach aims to uncover the truth and usually starts with a defined hypothesis.

On the other hand, design science research emerged from engineering and the science of the artificial(Simon, 1996). its primary objective is to create artefacts, such as socio-technical systems, that enhance the analysis, design, implementation, and management of technologies (Deng & Ji, 2018). Unlike behavioural science, which aims to understand the truth and

reality, design science focuses on creating artefacts that serve a specific human purpose and solve critical problems or improve practice. Both paradigms are essential and involve people, organizations, technology, and their interactions.

3.3. Selection of Design Science Research

In line with Van de Ven (2007), the researcher views research as a problem-solving activity. When viewed as a problem-solving process, research increases our understanding of complex problems that exist under conditions of uncertainty. The design science paradigm seeks to create new and innovative artefacts to solve real-world problems (Hevner & Chatterjee, 2010; Mullarkey & Hevner, 2019). An artefact is described as something constructed by humans and is artificial as opposed to being already present in nature (Hevner et al., 2004; H. A. Simon, 2019). The artefact could be a construct, model, method or instantiation (Mullarkey & Hevner, 2019). Van de Ven (2007) argues that the solution to a problem-solving process is the application of a particular intervention that solves the problem identified. As the focus of design science research is to create artefacts which serve a specific purpose and address some problem, it is chosen as the methodology which guides this research. The design science research methodology is well-suited for addressing the research questions of this study and is useful for designing solutions to real-world problems.

3.3.1. Linking Philosophical Assumptions to Design Science Research

The philosophical foundations in design science research are not concretely established relative to other well-established research methodologies (Deng & Ji, 2018). This lack of established philosophical foundations highlights the importance of considering epistemological assumptions in design science research.

The question of epistemology, or how to achieve "true knowledge," is not separate from but inherent to design science research and evaluation (Niehaves, 2007). Epistemological beliefs underlie the approach to conducting and assessing design science research, which aims to augment the existing body of design knowledge. Design science research endeavours to add new insights to existing knowledge using design artefacts. Guidelines for design science research have been proposed to appraise the quality of such contributions and assess the research process that led to the new knowledge. These guidelines assist in attaining and assessing design knowledge, highlighting the inextricable link between epistemology and design science research. To evaluate design science research from an epistemological

perspective would involve scrutinizing how different assumptions of existing knowledge impact the way design scientists conduct and evaluate new knowledge (Niehaves, 2007).

There are mainly four prevailing views in the literature regarding the philosophical foundations of design science research (Deng & Ji, 2018). The first view is that design science research has its foundation in positivist research. Even though seminal publications on design science research (e.g. Hevner et al., 2004; Peffers et al., 2007) do not indicate it explicitly, these research papers implicitly have a positivist epistemological assumption (Niehaves, 2007). The second philosophical view, which is advocated by Vaishnavi and Kuechler (2015), based on representative research on design science methodology, considers design science as a separate research paradigm which stands next to positivism and interpretivism. The third philosophical view regarding design science is that it belongs to the research paradigm of pragmatism (Baskerville et al., 2015). The fourth view is that design science research can be positivist or Interpretivist (Niehaves, 2007).

This study has its philosophical underpinning in interpretivism in line with the views of Niehaves (2007). Design science research methodology is deemed suitable for this research as it fits the interpretivist paradigm and is suitable for understanding customer-retailer interactions. The researcher's view is also ingrained in the design of the artefact, which aligns with the interpretivist paradigm, which recognizes the researcher's perspective in the research. Understanding the views of people is critical in the interpretive research paradigm and should be the primary goal of interpretive research (Klein & Myers, 1999). Following this approach, the individual experiences of retail managers and designers are captured in the evaluation stage. The bias in these views is recognized in the study. The artefact designed in this research will have a varied impact in different retail settings as all the different retailers have different contexts, and there is no fit-all approach which could be designed or prescribed. Furthermore, the impact of the interactions is also unique to the customers. Summing up, the design research methodology adopted in this study aligns to the Interpretivist assumption of the research and is appropriate for the purposes of this study.

3.3.2. Main Design Science Considerations for Interpretivist Research

Niehaves and Becker (2006) discussed several considerations that should be considered when conducting design science research from an interpretivist perspective. The considerations applicable to this study are presented in Table 3.1. An interpretivist perspective in design science research refers to a way of understanding the world and

conducting research that emphasizes the subjective and contextual nature of people's experiences, meanings, and actions. In this approach, the researcher aims to understand and interpret the perspectives, meanings, and experiences of the people involved in the research rather than seeking to generalize findings to a larger population or establish cause-and-effect relationships. The considerations presented by Niehaves and Becker (2006) relate to the ways in which an interpretivist approach to design science research should be carried out, such as the need to be mindful of the subjective nature of people's experiences and to consider the context in which those experiences occur.

Table 3.1. Problem identification and evaluation considerations from an interpretivist perspective

Phase	Considerations from an Interpretivist perspective
Problem Identification	1. **Consider diverse interpretations:** To understand a problem situation, it's crucial to consider the different perspectives and interpretations of the individuals or groups involved in the situation. This nuanced understanding informs our approach to addressing it. 2. **Address biases and distortions**: It's important to recognize that biases and systematic distortions in the narratives of the participants can influence their perceptions of the problem and proposed solutions. Identifying and addressing these biases ensures a more objective and accurate understanding of the problem. 3. **Acknowledge social construction:** The problem being researched is often socially constructed through the interaction between researchers and participants. Researchers' approach and engagement can influence the participants' understanding and interpretation of the problem, and vice versa. Recognizing the role of social construction in the research process is essential. 4. **Examine contextual relevance and generalizability:** When conducting design science research, it's crucial to examine how the problem being studied is grounded in the social and historical setting of the research case. It's important to consider the context's influence on the research findings and the potential limitations or challenges to transferring insights to other contexts.
Evaluation	1. **Criteria for Evaluation:** Design evaluation involves an ongoing process of gathering and interpreting data about a design and its effectiveness. The criteria for completing a design evaluation will therefore depend on the specific goals and objectives of the evaluation, as well as the unique context and circumstances of the design being evaluated. Criteria for completing a design evaluation may include achieving data saturation, inter-rater reliability, or consensus on key findings. 2. **Social and historical context**: Evaluation findings of a research study are influenced by the social and historical context of the research and evaluation environment. Contextual factors can have a significant influence on study findings and conclusions.

	Therefore, it is important to consider the social and historical setting of a research study when interpreting and applying the findings.

3.3.3. Wicked Problem and Design Science Approach

A wicked problem is a problem that is difficult or impossible to solve because of incomplete, contradictory and changing requirements that are often difficult to recognize. A wicked problem in design science research is a complex, ill-defined problem that is difficult to solve due to its many interconnected components and its constantly changing nature (Mullarkey & Hevner, 2019). Wicked problems are often characterized by a lack of clear objectives, definitive solutions, and consensus among stakeholders on how to approach the problem (Rittel & Webber, 1984). These characteristics make wicked problems particularly challenging for design scientists, who must use their creativity and expertise to find innovative solutions.

In the context of this research, the design and integration of retail channels involve complex technology-enabled services that can be construed as an evolution from previous design models, which are constantly changing, and therefore becomes a wicked problem. According to Rittel and Webber's (1973), solutions to wicked problems are not true-or-false but better or worse. There is no immediate and no ultimate test of a solution to a wicked problem. Design scientists must use various research methods and techniques to tackle wicked problems like technology-enabled interaction design. They must also be willing to collaborate with a wide range of stakeholders,

In order to understand the wicked problem and devise a solution, in this research, we adopt the approach shown in figure 3.1. It is adapted from the “hypothesis test” approach used by IY. In this approach, a design hypothesis is formed not as a test instrument to examine whether the hypothesis is true or false but to compare the real world (actual customer activity). It is an iterative learning process in which the researchers change their frame of reference by introducing changes to the environment themselves (Uchiyama, 1998).

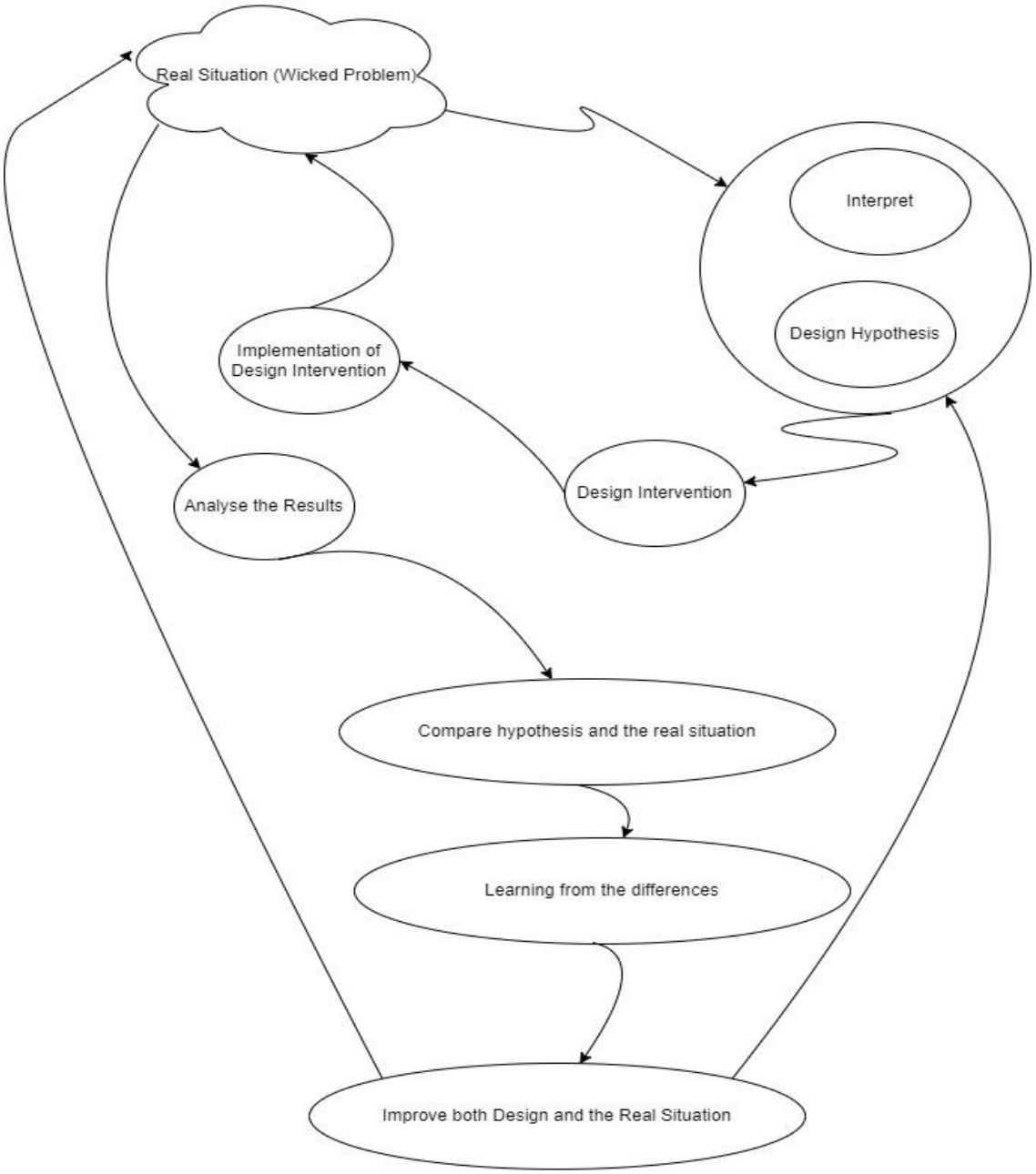


Figure 3.1. Approach to solving wicked problems

3.3.4. Design Science Research Roadmap

The design science research process ensures rigour in the construction and evaluation of the developed artefact (Hevner & Chatterjee, 2010). It is an iterative research process comprising i) problem identification, ii) design and development and iii) evaluation (Peffers et al., 2007).

The design science research steps are iterative (Mullarkey & Hevner, 2019; Sein et al., 2011). The research process is expected to have multiple iterations between the *design* and *evaluation* phases instead of one phase following the other like a waterfall process (Purao, 2013; Vaishnavi & Kuechler, 2015). Even though most design science researchers agree that design science research mainly revolves around the design and evaluation of the artefact, different versions of the design science roadmap have been proposed in the literature (e.g. Hevner *et al.*, 2004; Peffers *et al.*, 2007; Vaishnavi and Kuechler, 2015). Vaishnavi and Kuechler (2015) propose a five-step process for carrying out design science research by adapting the design process model by Takeda, Veerkamp and Yoshikawa (1990). The research process steps developed by Vaishnavi and Kuechler (2015) are i). awareness of the problem, ii). suggestions iii). development iv). evaluation, and v). conclusion. Peffers *et al.* (2007) propose a similar roadmap with slight variations. In the process proposed by Peffers *et al.* (2007), there are three main steps i) problem identification, ii) design and development and iii) evaluation. These are further subdivided into sub-steps as shown in Figure 3.2.

The overall research approach adopted by this study is shown in Figure 3.2. This research approach is mainly adapted from Peffers *et al.* (2007) and Vaishnavi and Kuechler (2015). Figure 3.2 describes the main stages of the research, the techniques used, and the outputs expected/achieved in the three main stages of this research. The data collection and analysis details are then linked to each of the three main stages. The main input for the first part comes from the semi-structured interviews as a part of the case study with an Irish retailer. The main input for the design and development comes from semi-structured interviews with experts. Focus groups and interviews with design teams are the main input for the application and evaluation stage. The upward arrows in the demonstration and evaluation steps in Figure 3.2 show the design process's iterative nature. Input from these steps is used to improve the artefact, which is then again evaluated, thus adding the rigour cycle as recommended by Hevner and Chatterjee (2010). The stages shown in Figure 3.2 depict a sequence, but it is not suggested that the process was executed in a strict, linear "waterfall" style. Instead, this approach allowed for a more flexible and adaptive approach to the design process.

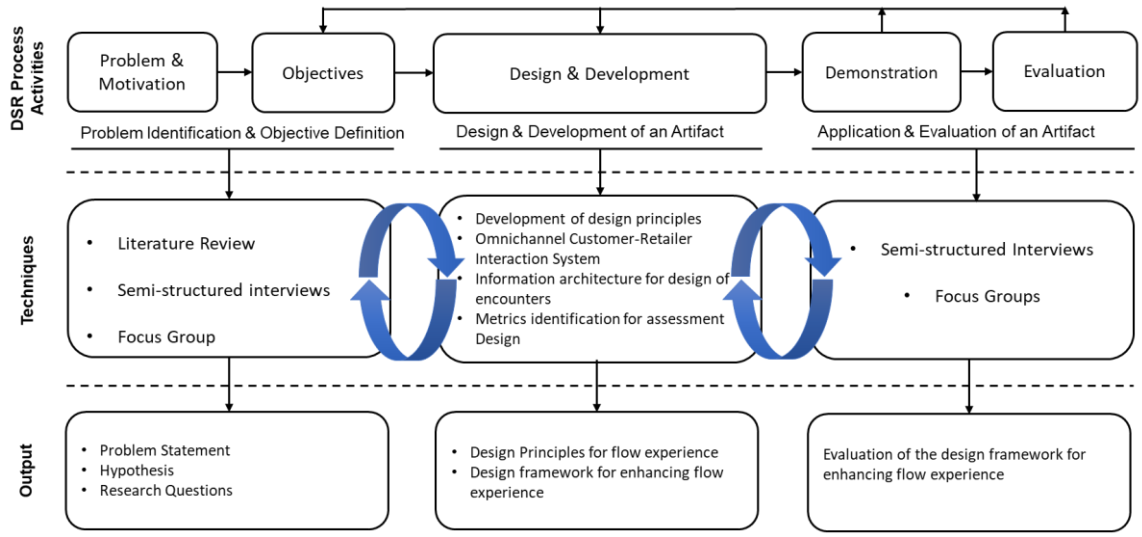


Figure 3.2. Techniques and Outputs in Design Science Research Process [adapted from Peffers et al. (2007) and Vaishnavi and Kuechler (2015)]

3.4. Data Collection and Analysis

The data collection and analysis are presented separately for each of the three main stages in the design science research process (problem identification, design and development, and evaluation). Data collection and analysis techniques for each phase are described in the following sub-sections. Most of the data collected for this research was in relation to the primary case study of this research. In line with the recommendations from Yin (2017) and Flyvberg (2006) for choosing the case according to pre-defined sample criteria, the retailer was selected that met the criteria of transitioning from multichannel to omnichannel during the period of engagement. This strategic choice of the case adds to the potential generalizability of a case study (Flyvberg, 2006). The case retailer is an Irish retailer with brick-and-mortar as their starting point around 50 years ago.

3.4.1. Case Description

The Irish retailer (hereafter called "IR") selected for the case study was established over 50 years ago to help Irish designers grow and create an extensive market of handcrafts in Ireland. Today IR is one of the largest Irish companies that sell high-quality design products through numerous stores across the country and an e-commerce presence with over 25,000 stock-keeping units (SKUs). The product line is highly versatile and includes a wide range of items such as fashion, knitwear, accessories, jewellery, cutlery, art and others.). It employs

over 350 people and has a strong relationship with Irish designers and an established and loyal customer base. The firm's strength lies in quality products and customer experience delivery in brick-and-mortar stores. Compared to competitors, the firm's main distinguishing feature is its customers' outstanding in-store experience through atmospherics and interaction with knowledgeable, empathetic, and ready-to-help sales associates. The firm's key strategic direction is to be a customer-centric company that sells products in the middle range.

The marketing manager at IR stated the following while describing the main distinguishing feature.

"IR (sic) has a very loyal customer base. It has historical value in the market, in terms of appealing to an older demographic of people who have been loyal customers for a long time and are strong advocates for the brand. Additionally, there are many players in the market, but gifting and luxury gifting is a particularly strong touchpoint for IR. As a result, gifting is often the initial way that people are introduced to IR. It is a go-to place for buying gifts, whether for yourself, for a wedding, or for a new baby or new home. The customer experience is important and needs to be excellent, particularly when it comes to the luxury, top-quality products that IR offers. The lasting perception of IR is that it is a luxury, high-end retailer, which means that the experience should match that as well."

In most categories, it competes on quality rather than price, putting customers at the heart of what the company does. According to their CEO,

"Every decision we make is based on whether it's going to add customer experience and if the customer is going to come back to us."

They launched their online channel in 2010. Physical stores were initially managed independently from the e-commerce store. During the time of engagement with the company, the organization was faced with drastic changes in the retail industry and was transforming and aligning resources toward an omnichannel approach, with the major goal to integrate on- and offline channels to provide a seamless experience across all channels to their customers. IR had been investing substantial funds in improving the in-store experience, but the COVID-19 lockdown caused large drops in daily footfall. IR required innovative approaches and restructuring of customer-retailer interactions. The retailer was in search of efficient solutions which would be able to reflect their emphasis on personal

interaction, would be completely safe in nature and would be accepted by the customer in the new retail reality.

3.4.2. Problem Identification and Objective Definition

The main objective of problem identification was to identify the customer-retailer interaction challenges faced by IR as it was transitioning from multichannel to omnichannel retail. This process was iterative and involved a combination of findings from the case, literature review and findings from the industry best practices. The case of IR was selected because of this being an information-rich case (Flyvberg, 2006; Johansson, 2007) as the information content from this retailer was expected to be most relevant to the research enquiry. Mullarkey and Hevner (2019) emphasize the importance of engaging with the problem early on in the design process, and a long engagement with IR allowed for comprehensive identification of the problem. The following sub-section describes the data collection and analysis for the case data. The process for the literature review in the problem identification phase is described in Appendix A3.

3.4.2.1. Data Collection

A multi-method data-gathering strategy was followed for the case study combining interviews, observation and secondary sources (Yin, 2017). Using multiple methods allows triangulation of the data collected to ensure the validity of results from the case (Johansson, 2007). The details of the case are described in Section 3.4.1. The researcher conducted semi-structured interviews with the CEO, Strategy Director, E-Commerce Director, Marketing Manager, Web Store Manager, Logistics Head, Head of Store Operations and Store Manager. In total, eight interviews were carried out with all the IR employees. The field of customer-retailer interactions in omnichannel is new, and the people dealing with the implementation of omnichannel can have different roles and titles. The snowball sampling method was employed from the beginning as it is difficult to predict the relevant people within an organization when studying a very new phenomenon as different organizations approach it differently before a standard best practice takes over and becomes a norm in the industry (Creswell & Poth, 2017). Snowball sampling is quite a useful way to interview relevant people.

Semi-structured interviews are a well-established method of getting qualitative data because of their ability to provide in-depth, rich and detailed accounts of the research enquiry but

still offer relative comparability (Al-Saggaf & Williamson, 2004; Creswell, 1998). The choice of semi-structured interviews was made because the research explores a relatively new phenomenon, and detailed but focused responses will offer new insights. The topics addressed concerned the challenges in the implementation of the omnichannel strategy from the point of view of each interviewee's position. All interviews lasted between 60 to 150 minutes. The interview guide for problem identification is in Appendix E. It contains a set of open-ended questions designed to help identify and understand the underlying issues and challenges at IR. To validate the problem identified, a focus group was conducted with four IR employees.

3.4.2.2. Data Analysis

A structured process was followed for data analysis, made up of a within-case study analysis following the "relying on theoretical propositions" strategy suggested by Yin (2017). Template analysis was used to analyse the data collected through semi-structured interviews. Template analysis is a type of thematic analysis which combines the structured approach of analysing textual data with the flexibility to modify coding according to the requirements of the study (King, 2012). Template analysis allowed making sense of a relatively large amount of data by the formation of broad as well as narrow themes before starting the analyses. We iteratively analysed the qualitative data by moving back and forth between the data from the case study and the literature review. The prior knowledge from the literature was used to form codes and then add other codes during the analysis process and vice versa. Nvivo was used to store, manage and analyse the interview data. Nvivo is a good choice of software for the analysis of qualitative data, especially for doing thematic analysis. Figure 3.3 shows the number of interviews and references for each code in Nvivo. Figure 3.4 visualises the parent code (problem identification), child codes and the relevant interview transcription files. For triangulation, we used secondary sources, including financial reports, the website and social media pages of the retailer. In this data collection process, we followed the principles suggested by Yin (2017) to guarantee the reliability and validity of the research.

Name	Files	References
Problem Identification	13	35
VR Store Design	3	3
Touchpoints	5	8
Third party technolog	7	14
Social Media Integrati	3	3
Retailer and Custome	2	3
Channel Role Expecta	4	4

Figure 3.3. Codes with the number of files and references

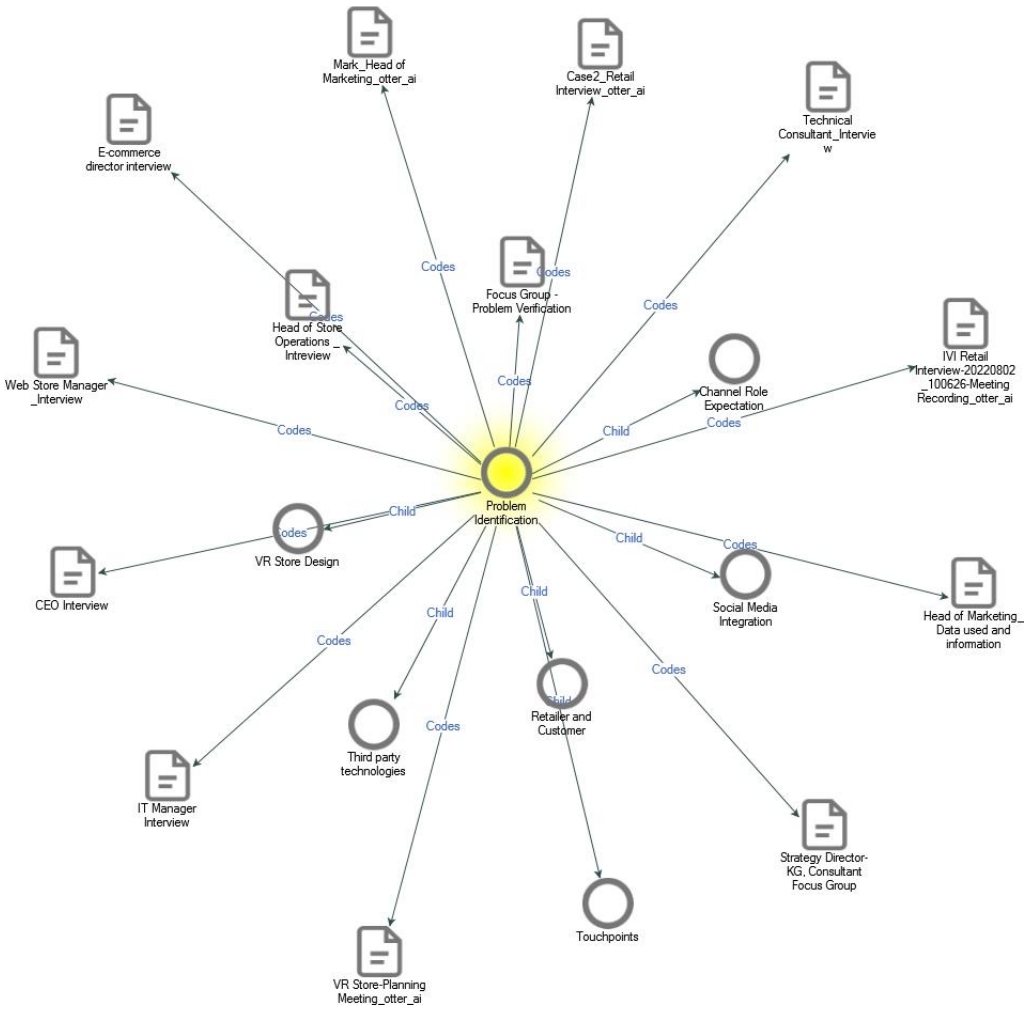


Figure 3.4. Visualisation of codes within problem identification

3.4.3. Design and Development of the Artefact

This section elucidates the specifics of the artefact design, including the design framework and its constituent models, as well as the development of design principles. Chapter 5 expounds upon the design of the artefact and design principles, with the aim of addressing RQ.3. The design artefact underwent refinement through an iterative design process, utilizing feedback from retail practitioners, including managers and designers, during the demonstration and evaluation phases. The research methods and techniques employed throughout the design and development phases are delineated below.

3.4.3.1. Modelling Language

The ArchiMate modelling language has been employed to represent the different models and their relationships within the proposed design framework (Omniflow framework). This research adopts the ArchiMate modelling language due to its ability to model and describe complex systems and their dependencies effectively. The ArchiMate modelling language provides a comprehensive set of notations for the key concepts and relationships (Anastasios, 2014).

ArchiMate modelling language is a type of domain-specific modelling language that is utilized to represent domain-level knowledge effectively (Bastidas, 2021). The employment of the ArchiMate modelling language in the present study ensures consistency across different levels of the framework. The ArchiMate structure provides clarity and consistency in the different levels of the framework, which is crucial for the effective utilization of the omniflow design framework.

3.4.4. Application and Evaluation of the Artefact

The design science research guidelines highlight the importance of thoroughly assessing the effectiveness of developed artefacts in addressing identified challenges (Hevner & Chatterjee, 2010).

There are two main categories of evaluation: formative vs summative evaluation and ex-ante vs ex-post evaluation (Venable et al., 2012). Formative evaluations are used to gather and analyse data in order to improve the characteristics or performance of the product, service, or program being evaluated. This type of evaluation focuses on the consequences of the evaluand and is intended to support decision-making that will improve its performance.

Formative evaluations are typically conducted during the development process, and they can help identify areas for improvement and guide future actions. For example, a formative evaluation of a new customer service program might provide data and insights on how to make the program more effective, efficient, or user-friendly.

Summative evaluations are used to assess the effectiveness of a product, service, or program after it has been implemented. They provide empirical data and interpretations that can be used to create shared meanings about the evaluand in different contexts. Summative evaluations are concerned with the meanings of the evaluand and are designed to support decisions about its selection for a particular application. For example, a summative evaluation of a customer service program might provide data and insights on how well the program is meeting its objectives and whether it is worth continuing or expanding.

Ex-ante evaluation is recommended during the design and development of the artefact. Ex-ante evaluation is the initial assessment of the artefact in its early stage before the design is completed (Venable et al., 2012). The aim of conducting the focus group study for ex-ante evaluation is to enrich and improve the knowledge base with insights from business practices and learning (Altuntas et al., 2015).

Ex ante evaluation takes place before a product, service, or program is implemented, while ex-post evaluation takes place after implementation. Ex-ante evaluation is a predictive evaluation that is performed before a product, service, or program is implemented. It is used to estimate and evaluate the potential impact of the evaluand in future situations and to make decisions about whether or not to acquire or develop it.

The distinctions of formative vs summative and ex-ante vs ex-post evaluations are typically used to evaluate a particular system or technology in relation to a specific problem or situation. For example, an IS formative evaluation might be used to improve a new software application during its development, while a summative evaluation might be used to assess the effectiveness of the application after it has been implemented. In the context of design science research, these concepts can be translated to evaluate a new kind of artefact, such as a design solution, for addressing a specific problem. For example, an ex-ante evaluation of a design solution might be used to decide whether or not to invest in its development, while an ex-post evaluation might be used to assess its impact on the organization or its users.

3.4.4.1. Evaluation Criteria

Another important aspect is what to evaluate, which refers to the properties of the evaluand (i.e., the product, service, or program being evaluated) that should be examined during the evaluation. Venable (2016) identified four main strategies for evaluating design solutions in DSR i) Quick & Simple strategy, ii) the Human Risk & Effectiveness evaluation strategy, iii) the Technical Risk & Efficacy evaluation strategy, and the iv) Purely Technical Artefact strategy. The Quick & Simple strategy involves evaluating the design solution quickly and easily, using simple methods and techniques. The Human Risk & Effectiveness evaluation strategy involves evaluating the design solution in terms of its potential risks and effectiveness for human users. The Technical Risk & Efficacy evaluation strategy involves evaluating the design solution in terms of its potential risks and efficacy for the organization or its technical systems. The Purely Technical Artefact strategy involves evaluating the design solution purely on its technical merits without considering its potential impact on human users or the organization. In this research, a human risk & effectiveness evaluation strategy was deployed. The Human Risk & Effectiveness evaluation strategy focuses on formative evaluations early in the design process, potentially using artificial or simulated evaluations to assess the design solution's potential risks and effectiveness for human users. As the design process progresses, the strategy emphasizes more naturalistic formative evaluations. Near the end of the process, the strategy emphasizes summative evaluations that rigorously assess the effectiveness of the design solution in real-world organizational situations over the long term and despite the potential challenges of human and social factors that may affect adoption and use. This strategy aims to ensure that the design solution has the desired utility or benefits for human users and continues to provide value over time. We adopt the human risk & effectiveness strategy, as it is effective for our design science research project, which has a major design risk that is social and user-oriented. The four evaluation episodes (EVAL1-EVAL4) are applied in this research, as shown in Figure 3.5.

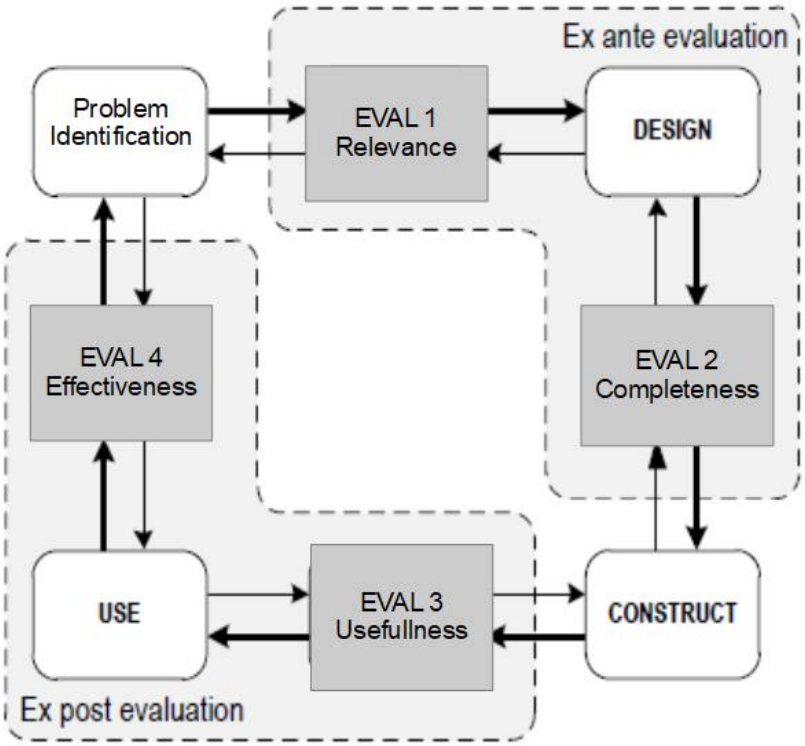


Figure 3.5. Evaluation Approach

Table 3.2. Details of evaluation methods

Evaluation Criteria	**Type of Evaluation**	**Applied Method**	**Interviewee/Participants**	**Number of Interviews/Focus Groups**
Completeness	Ex-ante, Naturalistic	Interviews (Creswell and Poth, 2017; Nowell et al., 2017)	Brand & Commercial Director Strategy Director Head of Retail Stores IT Manager	8 interviews (60-150 minutes)
Usefulness and applicability	Ex-post, Naturalistic	Focus Groups (Krueger, 2014)	IT Manager Head of E-commerce Marketing Manager Data Analyst Customer Service Manager	2 Focus Groups

			Marketing Manager Head of Retail Operations Technical Lead VR Developer E-commerce Developer	
Effectiveness	Ex-post, Naturalistic	Interviews (Creswell and Poth, 2017; Nowell et al., 2017)	IT Manager Head of E-commerce CEO Strategy Director Head of Retail Operations Marketing Director	12 interviews (30-60 minutes) 1 Focus Group

3.4.4.2. Data Collection

Table 3.3 lists the different types of data sources used for the evaluation. The data were collected through a range of data collection methods that allowed depth and vitality and helped in understanding the current model extensively and in developing new concepts (Dearnley, 2005). The major methods used for evaluation were semi-structured interviews and focus groups. Table 3.2 details the evaluation methods used for each evaluation criterion, including the type of evaluation, applied methods, interviewees or participants, and the number of interviews or focus groups. The participants included executives such as the brand and commercial director, strategy director, head of retail stores, IT manager, head of e-commerce, marketing manager, CEO, and the technology developers and analysts including the data analyst, VR developer, e-commerce developer. The participants were selected to evaluate the design framework and the associated design principles. We selected the participants across different areas within IR and at different level of management to ensure diversity in roles and expertise. However, all of these participants had an active role in designing new interaction and services within the omnichannel context. We also conducted collaborative workshops with the selected participants, gathering their perspectives and feedback to refine the omniflow framework and the associated design principles. The number of interviews and focus groups varied, with eight interviews lasting between 60 to

150 minutes for the completeness evaluation, two focus groups for the evaluation of usefulness and applicability, and 12 interviews lasting between 30 to 60 minutes and a focus group for the effectiveness evaluation (Venable et al., 2012). Focus group design is explained in the next section.

Table 3.3. Data Sources for Evaluation

Type of Data	Data Sources
Primary Data	Observations Meetings/Workshops Semi-structured Interviews Focus Groups
Secondary Data Sources	Digital Strategy Documents Software service platforms Third-party service providers

3.4.4.3. Focus Group Design

Focus groups offer great potential for qualitative research as they allow for the collection of multiple views in one sitting, enabling the dynamics of opinions to come out through group interaction and participant spontaneity (Morgan, 1997). In the context of design science, focus groups offer tremendous opportunities for researchers to gain insights into the perspectives of multiple users. By facilitating a discussion around the design artefact, focus groups provide a platform for users to share their needs, preferences, and attitudes, which can inform the design decisions (Krueger, 2014).

The framework was used by focus group participants, who were involved in designing one of the services explained in Section 6.2. To create a relaxed atmosphere, in accordance with Krueger's (2014) recommendation for self-disclosure in focus groups, the researcher ensured that participants felt comfortable during the focus group sessions. The researcher acted as both moderator and observer during the focus groups, facilitating the discussion among the participants while refraining from participating in the conversation (Seidel et al., 2018). The focus group was audio recorded, and the researcher also took notes during the session, paying particular attention to any visual cues used by participants. Given that visual cues can reveal participants' feelings, it was important to note them, as the video was not recorded (Krueger, 2014). To prevent coercing biased responses from participants, they were

informed that it was acceptable to express no opinion on particular parts of the platform (Seidel et al., 2018).

The focus group followed Krueger's (2014) framework, consisting of four phases: opening, introduction, transition, and key phase (Seidel et al., 2018). Participants were encouraged to sketch on the board, and pictures were taken of this activity. Additionally, notes were continuously taken during the focus groups by the researcher.

The focus group began with an opening phase (phase 1), where the participants were introduced to the purpose of the focus group and got to know each other. In the introductory phase (phase 2), customers reflected on their initial experience using the design framework. In the transition phase (phase 3), participants shared their initial impressions of the design framework. In the key phase (phase 4), participants were shown specific parts of the framework and asked to discuss their experience of using these parts. This phase took the most time and was the key section of the focus group. Based on the insights gained from these two focus groups, the researcher modified the overall framework and its constituent models shown to and used by participants (Seidel et al., 2018).

3.4.4.4. Data Analysis

Nvivo was used to store, manage and analyse the interview and focus group data collected for evaluation. NVivo was selected as the tool for analysis as it is suitable for qualitative data, especially for doing thematic analysis (Nowell et al., 2017). The data collected from the focus groups and interviews were initially transcribed using audio-to-text software and subsequently uploaded onto Nvivo. In a subsequent step, the notes from the researcher were integrated. The information gathered through the case study was elaborated by applying data categorization and contextualization techniques suggested by Miles and Huberman (1984) and Silverman (2013) before data analysis. The combined data was then subjected to analysis in order to evaluate the completeness, usefulness and effectiveness of the artefact. The results are discussed in Chapter 6 (Demonstration and Evaluation).

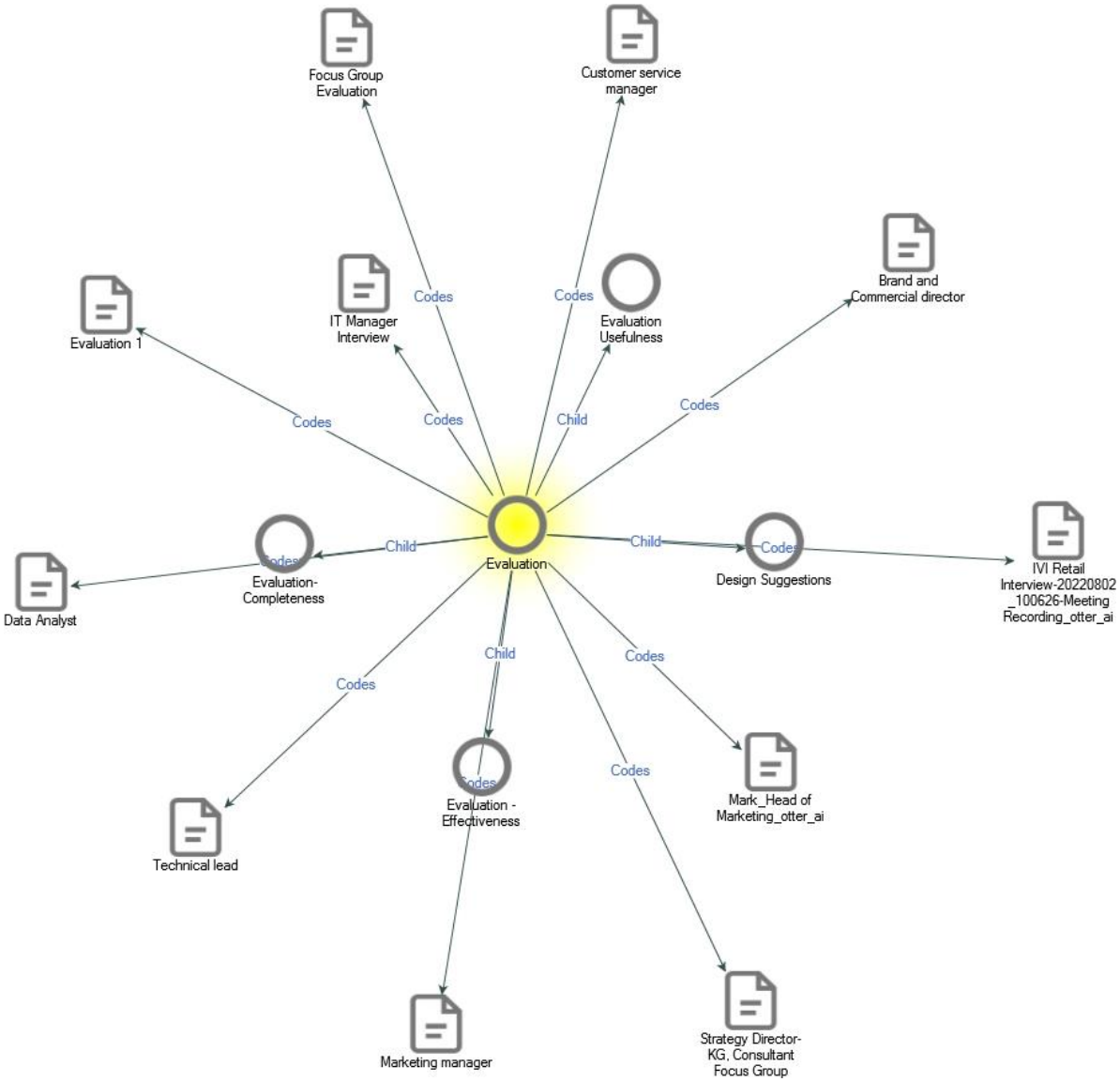


Figure 3.6. Visualisation of evaluation codes in Nvivo

3.4.5. Communication

The results of the earlier evaluation of the design framework were shared with the people involved in designing and developing different services based on the design framework, such as designers, developers, and managers. This communication is important because it allows the practitioners and stakeholders to understand how the artefact has evolved. It also allows them to identify any issues or areas for improvement and make adjustments as needed. The outcomes of this research were also shared with the academic audience throughout the PhD

journey in conferences and journals. The list of publications related to this study is provided at the beginning of the thesis.

3.4.6. Validity and Reliability

Objectivity in research is comprised of two components: reliability and validity (Ostrowski, 2014). Reliability refers to the consistency of results produced by a measurement procedure, regardless of when or how it is carried out. Validity, on the other hand, refers to the accuracy of the results or how well they reflect the actual phenomenon being studied. It is essential for research to achieve parallel reliability and validity in order to ensure objectivity. Although it's feasible to attain perfect reliability without validity, achieving perfect validity ensures perfect reliability for every observation.

In this study, the researcher used a logical research design and established the quality of the design based on four logical tests (construct validity, internal validity, external validity and reliability) as described by Ostrowski (2014). To ensure construct validity, we used multiple sources of evidence to encourage convergent and consistent lines of inquiry, and we maintained a chain of evidence to trace any evidence from the initial research enquiries to the final conclusions and vice versa to ensure internal validity. We used NVivo software to store, manage, and analyse the interview and focus group data for evaluation. To increase external validity, we have described the case in detail to establish the complete context so the research can be replicated. Finally, we used standardized procedures such as ArchiMate language to increase the reliability of the design and reliable measures defined for evaluation to increase the reliability of the results.

3.5. Summary

The research uses the design science methodology to solve a wicked problem in the context of omnichannel retail. The design science research approach helps to ensure the research is both accurate and dependable. The study uses various sources of evidence from the case study for problem identification and evaluation. It also includes validation with domain experts to address the validity of the research. The research also introduces the factors in the design process, such as the modelling techniques.

Chapter 4

Problem Identification

Chapter 4 discusses the results from the problem identification phase of the research. The problem identification phase is the starting step in this research process. The results of this phase provide the basis for the subsequent phases of the research, including the development of the design framework and the evaluation criteria.

In order to design an effective solution, a thorough investigation of the problem and its underlying principles was necessary. This process was iterative and involved a combination of findings from the case study, literature review and findings from the industry best practices. Mullarkey and Hevner (2019) emphasize the importance of engaging with the problem early on in the design process. A long engagement with IR allowed for a proper evaluation of the problem and the identification of the best approach to solving it. Data was collected through multiple methods to identify the problem. The data collection and analysis are explained in Section 3.4.2. To validate the identified problem, a focus group study was conducted. The focus group consisted of four IR employees who had firsthand experience with the problem and had worked closely on the new interaction design. The focus group confirmed the problem identified i.e., the lack of actionable guidance for ensuring flow in the customer journey across different channels. The analysis of the focus group and the preceding interviews confirmed that the research problem was meaningful for practitioners. This iterative process of investigation and validation allowed for a comprehensive understanding of the problem and ensured that the proposed solution would be relevant and effective. Therefore, the design process was able to proceed with a solid foundation of research and understanding.

4.1. Customer-Retailer Interaction at IR

4.1.1. IR Customer Journey

The purchase journey for new customers at IR typically starts with the brand visibility touchpoint. The journey would most likely continue successfully if the experience at the next

touchpoint aligns with the expectation from the first brand visibility touchpoints. The different types of touchpoints have been explained in the Section 2.2. For example, if a customer clicks through from an online ad (brand visibility touchpoint) and moves to the website's landing page (hybrid touchpoint) should be relevant and aligned with the expectation customer formed in the first touchpoint. For repeat customers, IR has the ability to personalize their journey based on previous experiences. Email is a highly effective tool utilized by IR for pushing information to its customer database. By utilizing email as a marketing channel, IR effectively targets and engages its existing customers with personalised promotions. The strategy director at IR explained typical considerations in IR's customers' journey.

"A typical customer journey begins with promotion and visibility of the brand. From a channel perspective, it starts with how the customer first encounters our brand, and then the journey of experiencing our brand. For example, if a customer clicks on an ad, the landing page on the website should align with the reason for clicking on the ad. For repeat customers, their browsing journey can be personalized through tracking cookies or previous experience, to offer them tailored products and promotions."

Additionally, the customer journey can start with a direct visit to the physical store and speaking with a sales assistant (interpersonal touchpoint) or direct contact with the telesales department (interpersonal touchpoint). Providing flexibility regarding the customer journey is critical for IR as its customer demographic and technology comfort level varies significantly. It's crucial to segment customers into different groups and map out the channel they're likely to come through and what they're looking for, and make sure the experience level stays the same. For example, when a customer comes into a physical store, it's important to understand their needs and preferences. Staff can link-sell other products that align with the customer's expectations. IR is still working on personalizing the experience in the same way in its online channels. However, the main focus of IR is to ensure the customers go to the right channel. The marketing director at IR explains this as follows.

"It's also important to ensure that the marketing journey lands them in the right channel, with the specific product they had in mind or the journey they expected to embark on."

4.1.2. Impact of Covid-19 lockdown for IR

4.1.2.1. Impact on IR's Sector

Even before the global pandemic, the retail sector was going through a major transformation with the shift from offline to online and from single to multi- and omnichannel commerce for the past decade (Piotrowicz & Cuthbertson, 2014). It has been an ongoing process for retailers and includes the implementation of a technological infrastructure that incorporates data from all kinds of sources, such as supply chains, current stocks, as well as product, customer and social media data (Iftikhar et al., 2020).

At the onset of the pandemic, throughout January and February 2020, the new Covid-19 virus was increasingly discussed in international media, but the retail industry was mostly carrying on as normal in Ireland. However, in mid/end of March, most European governments took serious actions to contain the virus spread, such as the closing of retail stores which do not provide essential needs effective within two or three days. The national government in Ireland announced that from 27th of March 2020 that all stores which do not serve primary basic needs (e.g. food retail, medicine, pharmacies, drugstores, post offices, banks and similar) need to close in order to minimize social contacts and, therefore, the risk of virus infection (Morland & Szymanska, 2020).

Agile operating was necessary even though preparation for such a disruptive situation was impossible for most retailers. At that time, it was uncertain for how long retailers would have to shut down their offline businesses, which in the end turned out to last for months. Though, all retailers regard the shift from offline to online commerce as a long-lasting change in customer behaviour. The retail manager noticed that many customers still stick to online channels after months of the lockdown. Another retailer mentioned to regularly conducting customer surveys in the future to better understand which channel they use, and which products are of interest. Overall, retailers noticed lower store traffic compared to pre-Covid-19-times, while customers spend more on a single shopping trip. The retail manager adds:

"In other words, the omnichannel effect, this ROPO (research-online-purchase-offline) effect that customers inform themselves in advance on the Internet and then visit the store with a very specific purchase intention, is even stronger than before."

4.1.2.2. Impact on IR

IR had already taken steps to upgrade its website before the Covid-19 lockdown, enabling them to better handle the increased traffic to its website. Additionally, they introduced new services, such as the virtual reality store, as described in detail in Section 6.2. The Head of E-commerce noted that the closure of physical stores during the pandemic posed a challenge for selling products but emphasized the importance of having a robust online presence, particularly through a well-designed website, which allowed for continued sales. He said,

" Of course, the problem during the pandemic was that physical stores were closed, making it difficult to sell products. However, having a strong online presence, specifically through a well-designed website, allowed for continued sales."

After the lockdown, IR noticed a change in customer behaviour with many customers sticking to just the online channels, however a lot of customers, especially the older demographic started coming back to stores as they sought out opportunities to enjoy events and shop in-store, preferring the traditional approach to shopping and retail. The Head of Marketing observed,

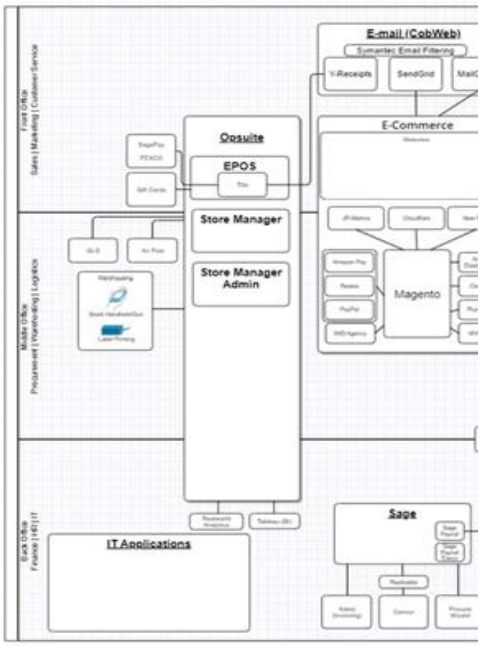
"Our website is continuously growing and has been growing since COVID. Really, when the stores were closed a huge customer base shifted to online and overall channel wise online is growing. But I think that the older demographic as well are kind of people who are elderly and they like to go in there and enjoy any events again, they want to get back in and shop and they want to actually get experience they want to get in store they want to meet somebody want to have the chat rather than going online and buying".

4.1.3. IR System Architecture

At the start of the engagement, IR's system architecture was organized as shown in Figure 4.1. It is divided into the front office, middle office, and back office. Several connections between different IT applications and software support the overall retail operations, including finance software Sage, e-commerce platform Magento, in-store EPOS system, and logistics systems GLS and Anpost. The connections between the e-commerce platform Magento and the in-store POS system, which enable customers to make purchases both online and in-store.

Our analysis of a retailer's system architecture, we identified several key connections missing. There was no connection with social media channels. Also, there was no connection of telesales with the e-commerce platform.

Figure 4.1. IR System Architecture



4.1.4. Main Challenges in aligning on- and offline Channels

In 2019, the management set up a "Go Digital" initiative and defined a range of important steps and investments around channels, technology, and organizational restructuring to realize an omnichannel strategy. In this ambitious and challenging endeavour, due to its digital coverage and scalability, the web-shop represented a particularly important role. However, since its introduction in 2011, it was still considered to be behind expectations and not developing its full potential regarding sales performance—unlike the flourishing offline business.

The web shop was characterized by weak performance and inefficiency as it merely accounted for around 5% of the company's overall revenue but still made use of about 25% of the overall marketing budget in 2018. One of the reasons was attributed to the fact that substantial amount of resources were invested in short-term campaigns that failed to engage customers and ensure customer retention. The performance mismatch of both channels was also evident through a significantly lower number of online repeat customers compared to offline buyers. In fact, most of the online sales the company achieved were largely generated

from customers located in counties where the retailer owned physical shops. Especially value-driven customers were prominent as online customers, underlying a discrepancy to quality- and service-driven offline customers. From a website metrics perspective, organic search was dominating, and substantial referrals from the company's social media presence failed to appear. This indicated a weak connection to customer activities on social media.

Another issue concerned the continuous downtime of the website and issues such as product listings not being displayed. The company recently moved its website from Magento 1 to Magento 2 and the customers were coping with downtime arising from the change. However, the most significant aspect the retailer was concerned about was the company's web-shop providing no experiential features as such and not being able to deliver a similar shopping experience as the company's physical shops do. The management agreed that this issue represented a major flaw in the online channel.

In this context, a challenge was also the quality of product images and videos provided by the suppliers for the web-shop. This problem emphasises the role of third-party technologies and how they affect the retail customers' experience. The retailer could not use around 80% of the content provided by designers since they were either of poor quality and/or were inconsistent across suppliers. The lack of an efficient and integrative customer relationship strategy with Irish suppliers of high-quality design products was addressed in this regard and considered another major shortcoming.

The management realized early that one of the reasons the company was facing such difficulties was the fact that going digital represented an afterthought. Before the idea of following an omnichannel approach, physical store and online shop managers were judged based on the performance of the channel, they were responsible for. Store managers were only looking after sales in their shops and were completely indifferent to the performance of the web store. The same applied to online managers who were focusing their efforts on online performance. The CEO explained this issue as follows.

"The problem people have with these multimedia omnichannel approaches is that it can be difficult to track and understand the goals and expected outcomes for each channel. It would be helpful to have a clear understanding of what can be achieved with each approach. In the online world, having an idea of what to expect would help in making

decisions. If you can provide that, it will make it easier for people to understand why certain outcomes may not have been achieved. This understanding of expectations is the key."

Another difficulty the retailer was facing concerned content personalization. The company was struggling to retrieve insights about its customers and was not capable of identifying if the customers were online or in-store shoppers, whether they were frequent shoppers or occasional/seasonal shoppers, gifting shoppers, or just looking for something for themselves. The major reason was assumed to be the absence of a well-established practice to capture customer data and use the data stored in a database to understand clients' interests, preferences, genders, and names to establish a well-organized and advanced procedure to customer segmentation for better targeting of customers and connections with them. On top of that, the retailer did not utilize any loyalty program or email targeting system to provide precise and personalized offerings. Instead, all email-sending campaigns were based on common occasions like Valentine's Day or Christmas.

The company was missing its potential in this regard was, accompanied by the fact that there was no strong relationship management with tourism customers online. However, sales associates play a significant role in building up and keeping a relationship with customers in-store. With tourists who are very likely not returning to the shops, bonding is made difficult. Certainly, tourists are able to visit the web-shop anytime and anywhere.

We identified the main problems that underlie the challenges and difficulties encountered by IR in aligning their offline and online channels. These issues are presented in Table 4.1.

Table 4.1. Problems identified in terms of channel alignment.

Problems	Description
The connection between the different company and third-party channels	• The website had a weak connection to customer activities on social media.
Impact of third-party technologies on customer experience	• The company recently moved its website from Magento 1 to Magento 2, and the customers were coping with downtime arising from the change. • The quality of product images and videos provided by the suppliers for the web-shop
Inconsistency in relationship building across channels	• There was no strong relationship management with tourism customers online. However, sales

	associates play a significant role in building up and keeping a relationship with customers in-store.

4.1.5. New Interaction Design Challenges

In response to the COVID-19 pandemic and the ensuing lockdown, IR launched a virtual reality (VR) store to provide customers with an experience similar to that of a physical store from the comfort of their homes. By offering a VR store, IR aimed to bridge the gap between online and in-store shopping experiences. The goal of the VR store was to offer customers the ability to visually browse and purchase products in an immersive, three-dimensional environment. This was especially important given that physical stores were closed due to the pandemic, which limited customers' ability to experience products in person.

The E-commerce Manager at IR noted the need for a VR store to provide customers with a similar in-store experience by visually browsing and purchasing products.

"Incorporating a virtual reality store with the website could enable customers to have a similar in-store experience by visually browsing and purchasing products. This was especially important at a time when people lost the in-store experience due to the closed physical stores."

The VR store provided customers with an immersive and interactive experience that was similar to the physical store experience and let to more engagement. While the VR store was successful in increasing customer engagement, IR faced challenges in ensuring a smooth transition between the VR store and other touchpoints. This highlighted the problem of understanding the customer journey and touchpoints involved to ensure smooth flow experience. Addressing this problem was challenging for IR, as it involved third-party systems that could not be quickly or easily changed. Another challenge was the lack of a holistic design perspective. The IT Manager noted

"I think one of the lessons we learned was that when we implemented the first virtual reality store for clothing sales, it turned out to be not right. Customers were not able to select different options such as size and colour, and the link to the website didn't bring customers immediately to the right product page. We needed to have a better understanding of the limitations for the links between Magento and the VR store."

Another challenge was the lack of resources allocated to maintaining flow experience across touchpoints outside of retailer-controlled ones, despite their increasing importance in the customer journey. For example, there were regular processes in place to test the various customer experience aspects of the websites, but no procedures in place to make sure customers access the right information when coming to IR's touchpoint from a third-party touchpoint.

Overall, the challenges faced by IR in terms of interaction design are i) the disconnection between touchpoints across the different channels and their underlying systems to support flow experience; ii) the lack of a holistic design perspective to create alignment and flow along the customer journey involving third-party touchpoints; iii) the limitation of conventional design and evaluation approaches.

4.2. Activities for Channel Integration and Flow Experience

The omnichannel transition of IR involved identifying multiple channel integration activities, each of which presented unique challenges, as summarized in Table 4.2. These activities were identified through a comprehensive review of relevant literature, which was then supplemented by industry best practices and a case study of IR. Details of the methods used are provided in Section 3.4.2.

4.2.1. Integrated Customer Service

Customer service integration refers to improving and enriching interaction with a customer by blending the interaction simultaneously with other channels (Bonetti & Perry, 2017; Hong, 2015). Around 85 per cent of customers who are not able to accomplish what they need in one channel, such as a website will switch to other channels such as phone, mobile app, web chat, social media or email (Hong, 2015). In-store customer service associates can use devices such as tablets and smartphones to provide enhanced customer service, for example by looking up information through the system to assist the consumer, thus reinforcing brand values and delivering a good shopping experience (Bonetti & Perry, 2017). To provide in-store experience online, retailers can offer services such as virtual fitting rooms based on virtual reality. Fits.me is a virtual reality application used by several fashion brands (such as Hugo Boss, Twin-Set and Thomas Pink) to provide online shoppers with service which is traditionally only available in stores (McCormick et al., 2014). It offers a

virtual fitting room for online shopping and suggests the garment size that is the closest match to the shopper's measurements, and enables the user to 'try on' several sizes to identify the preferred size and fit (McCormick et al., 2014). Similarly, to provide a digital experience in the physical store, services such as "on-screen customization" can be used. For instance, digitally enhanced stores such as Nike Town provide screens to customize one's shoes (Bonetti & Perry, 2017). Similarly, customer service can be improved in social media channels by utilizing services associated to retailers' website using applications such as eBay ShopBot, which deals with consumer search enquiries on Facebook messenger and a variation of the application is now available on the Google Home device.

IR is a customer-centric company. According to their Strategy Director, "Customers are at the heart of what [IR] does. So, the main thing and every decision we make is based off whether it's going to add to customer experience and if the customer is going to come back to us so growing our customer base and appreciating that and having an experiential customer experience that they want to come back to is probably number one at the top of things that we do." Being successful with this approach in their physical stores, now IR is finding it hard to exhibit similar levels of customer service in their online channels. The company recognizes this as a big challenge and their Strategy Director noted "Our customer-centricity doesn't come across in our online sites. You will not get that whole customer feel or that feel that the person is as invested in the customer as you will get if you spoke to a customer in the store. It's very different and hard to capture online."

4.2.2. Integrated Customer Traceability

When moving from one channel to the other, integrated customer traceability gives retailers the ability to maintain context and data continuity as the customer is moving from one channel to another channel (Bell et al., 2014; Larsen et al., 2017). Retailers can trace the customer journey started online and finished with an offline sale (Bell et al., 2014) using mobile technologies with services such as Google's offline sales conversion tool. Retailers can track the customer who explores a product offline and then buys online (Bell et al., 2014) using Google URL Builder. Using mobile ID tracking, retailers can use the consumers' smartphone's Wi-Fi to track their journey in the store and can know the repeat visitor and analyze the departments and parts of the store visited. Mobile Decision Support System can be used to check and compare reviews posted by consumers themselves and to extract the reputations of a product from weblogs (Groß, 2015). While retailers track customers across

channels, they collect, store, analyze and transfer a lot of personal data from customers. In doing so, they face the challenge of protecting this data from breaches (Nabbosa & Iftikhar, 2020).

IR has started to put more emphasis on connecting the customer across different channels but is struggling with technology implementation. The marketing manager noted, "We are trying to do that [add shopping links to Instagram] but we're hitting a lot of hurdles." Similarly, connecting the physical store customer to online channel has been a challenge, especially with the implementation of GDPR. Web-store Manager explains this issue saying, "We have thousands of tourists [customers] in our different stores. So we want to try and capture their information as best we can. With GDPR, obviously, we lost a big bit from our database."

4.2.3. Integrated Order Fulfilment

Traceability and changeability of inventory, orders and delivery points during all stages of order fulfilment across all channels is required for a fully integrated omnichannel system (Hosseini et al., 2017; Saghiri et al., 2017a). In an integrated environment, a retailer needs to be able to see inventory across channels, that it knows where products are available and how fast it can get them to customers. With integrated order fulfilment, customers should be able to reserve products in the store using a mobile phone, web or social media (Reserve and Collect) (Hosseini et al., 2017) and collect products bought using mobile phone, web or social media in the physical store (Click and Collect) (Ma et al., 2014). Customer can use their devices to reorder a product like Amazon Dash Button (Hosseini et al., 2017) and orders can be delivered to their place of choice in real-time like a car trunk using services such as Amazon Key delivery. Similarly, customers' needs can be predicted to have most of their regular buy in the store ready to be ordered online (Spiegel et al., 2013).

IR has invested in acquiring inventory systems to integrate its inventory across all channels. Logistic managers noted that the inventory system is updated very quickly across channels and said "…when it's all working fine within 30 seconds to a minute your [inventory system] should be updated. So, it is pretty much in real-time." But they are looking to improve further in this regard. Head of Store Operations addressing a good practice she experienced at another store, said, "I was in a store recently where I was looking for an item and she [sales assistant] said, what are you looking for? And I said, Oh, do you have that in whatever size

and she said not in the store but before I knew it, 10 seconds later, my card was in the back of an IPad, it was delivered to my house the following morning. That's what I want."

4.2.4. Integrated Transactions

Providing secure access to complete the transaction via all available channels constitutes integrated transactions. Regardless of how, where and within which channel the transaction is made, the relevant data should be securely retrievable by other parties in the integrated transaction system (Saghiri et al., 2017a). With integrated transactions, customers should be able to purchase products directly from all available channels e.g., social media outlets of the retailer and to purchase products directly from an advertisement on any channel e.g. TV or news advertisement, digital signage, catalogue. Customers should be able to check out without going through a physical check out desk using other channels for payment in store e.g. Amazon Go, Mobile and Tablet check out (Hosseini et al., 2017), thus adding value to marketing activities of the retailer.

IR management has recognized that integrated transactions are an important part of the transition to omnichannel retail. Head of Store Operations with regards to opportunities for integrated transactions noted "I want to have iPads that I can flip over, and people can pay. I want to be in a position where we don't have to bring a customer to a till all the time as well, as its too formal...I want to have something that I can use on the shop floor that they can just put their card into and just get that sale." Strategy Director mentioned on the similar lines saying "we are looking at Amazon pay actually. so, they just come into Ireland recently, they want to pilot with us. So, they would be someone we'd be looking at because, again, they have a lot to offer, I think in terms of the checkout and how to improve us in that whole space. So, I think that's an opportunity."

4.2.5. Integrated Product and Price Information

Integrated pricing and product information implies synchronization of the products' description, stock status, prices, and makes changes in them (e.g. discounts, availability) visible for consumers and other members of the omnichannel system instantly (Saghiri et al., 2017a; Wang et al., 2015). This integration should also pick up on any mistake, mismatch, or absence of product data anywhere in the omnichannel system, and initiate the necessary corrective actions (Saghiri et al., 2017a). Shopify and Google's direct integration makes it easy for shoppers to discover products available in-store with Google Smart

Shopping campaigns. Another example of an online-to-offline relationship is Sephora mobile application (Orendorff, 2018). Digitally enhanced stores such as Nike Town are providing i-Kiosks to look up information digitally (Bonetti & Perry, 2017). Retailers should also provide information based on customer social networks via different digital channels (Hosseini et al., 2017).

IR has generally adopted an integrated pricing strategy for its online and offline channels. As customers are now able to access online information easily when they are in physical stores, the pricing and product information needs to be consistent. But IR is struggling with providing additional information in stores, such as videos which they are providing to online customers. The words of the Head of Store Operations in describing this scenario were, "so much technology goes into websites and what we do online and all that I think we don't have enough technology in the store to provide details around products to our customers." But on the other side, information about products is lacking on the website as well. IR is now pushing towards more information and imagery on its website. Strategy Director explained, saying, "I'll be pushing the buyers now to adapt a lot more and since then, you need to come back from suppliers with content. You need to come back with imagery, and you need to come back with their story because if you don't come back with that, how can you sell that product online?"

4.2.6. Integrated Promotions

Promotion data must be shared and available across all channels and the product's/brand's name and logo should be consistent across all channels, and the promotions should use different channels at the same time (Willems et al., 2017). During the pre-purchase stage, retailers can use services such as digital signage showing videos, real-time pricing and product information that can be integrated with social media feeds that display consumers' reviews next to the merchandise to build the trust. Retailers can also use connected home appliances to sense customer needs and send personalized need-based offers through the mobile channel (Hosseini et al., 2017). During the purchase stage of the consumer buying process, retailers can use consumer-facing in-store technology to inspire and engage with the consumer using different channels and offering personalized offers and promotions (Lemon & Verhoef, 2016). Burberry, M&S, Nike and Macy's, for instance, have adopted interactive screens (e.g., iPads, i-Kiosks, tablet computers) through which consumers get promotions during the purchase stage. Besides, adaptive digital touchpoints enable new

forms of promotions. For example, by introducing firm-initiated mobile touchpoints, retailers can "provide tailored, time-sensitive, and location-sensitive advertising and promotions in store" (Groß, 2015).

IR is working on integrating its promotion activities across different channels. They are actively targeting the integration of their social media channels with their website. Marketing Manager commenting on their priorities said, "… and just integrating better with our social media campaigns. I think there is a big disconnect there."

4.2.7. Integrated Reverse Logistics

Integrated reverse logistics entails providing all channels for returns to customers and return visibility in all channels as well (Saghiri et al., 2017a). Integrated reverse logistics links among different stages of reverse logistics and different channels involved in it. So, information around the return point(s), stock keeping point(s), and product(s) reverse flow should be retrievable, traceable, and changeable using RFID like M&S (Angeles, 2016). retailers can easily provide services such as Buy online return in Store using RFID tagged products (Zhang et al., 2018). Retailers can, therefore, offer customers the ability to buy in-store and return via other channels, such as using the website and get the return collected from their homes.

IR is providing customers with the return to the store facility for products bought online but customers cannot return online (via post) the products bought in stores. Website Manager of IR said, "They [customers] can go into any of our stores and returns an online order if they have the receipt."

4.2.8. Integrated Analytics

Predicting customer needs and taking actions based on data available from all available channels is integrated analytics (Hosseini et al., 2017). With different types of data available from various channels such as interaction data (POS, e-commerce), enterprise data (CRM and ERP) and unstructured data (social media data) which can be fused on one platform to predict customer intent and take informed actions (Iftikhar & Khan, 2020). At the same time, the route of each customer and the time they spend in different channels deciding what to purchase can be analysed, similarly to the way it is analysed by checking out the clicks on an e-shop browser. If combined with data, extracted by the e-shop web analytics application

will allow the company to provide better and more accurate services and make product proposals, which can lead to a more gratifying interaction and raise sales (Boucouvalas et al., 2016). Swatch and American Apparel have implemented successfully mobile tracking in their stores to track and analyse customer journeys in the store (Bonetti & Perry, 2017).

Strategy Director at IR put special emphasis on integrated analytics and capturing customer data in physical stores stating "capturing customer data [physical store customer] is a big one. And segmenting is going to make us so that we understand whether they're going to go online or whether they have the appetite to do so."

4.2.9. Integrated Data Security and Privacy

Omnichannel retailers should ensure that privacy conditions are adhered to when data is integrated from different channels. Consumers are concerned about how retailers can track their locations and collect data about them and how it affects their privacy. Retailers must be aware of privacy issues, seek to comply with the law first, and ethically use tracking and inform consumers about the type of information collected and its purpose. Devices and sensors that upload large amounts of personal data to centralized databases controlled by intelligent device manufacturers or retailers may be exposed to privacy problems (Christidis & Devetsikiotis, 2016). Customers are becoming ever more concerned about their data privacy and retailer ensuring data privacy adds to the customers' perceived value and creates trustful customer relationships (Hosseini et al., 2017). Integrated data security implies keeping customers' data secure when moved from one channel to another. With the implementation of digital devices to achieve integrated channels, retailers are also facing the issue of data security. This information/knowledge flow should be protected by cybersecurity solutions to limit data theft and misuse.

IR considers capturing customer data a vital step in implementing an omnichannel strategy, but privacy and security concerns are not well addressed. For example, talking about implementing a loyalty program, Strategy Director said, "… and then absolutely the loyalty program again, I'll mention that I think we need to have a better connection to our customers physically like in terms of capturing their data and targeting them better."

4.2.10. Integrated Fraud Detection

Omnichannel retailing is more susceptible to fraud and needs an integrated fraud detection solution to address this new dynamic. Detecting fraud when a transaction involves multiple channels is integrated fraud detection. With digital and interconnected devices for channel integration, cyber-attacks become likely as mobile and internet of things (IoT) devices have limited computing power to detect such attacks (Xiong et al., 2018). IR was not considering an increased risk of fraud associated with omnichannel at the time of the case study.

4.2.11. Summary of challenges Channel Integration Activities

IR's challenges in channel integration activities are summarised in Table 4.2. The channel integration activities and challenges listed in the table can be divided into two categories to provide a positive customer experience in omnichannel retail (Bèzes, 2019). The first type of channel integration activities are based on finding operational synergies for the company. These activities are integrated reverse logistics, order fulfilment, analytics and transactions. Most of the time, they are not directly visible customers even though they can lead to better customer experience. In these activities, only the company's technology and organization are the drivers of omnichannel integration. The second type of integration activities are visible to customers and directly affect the customer experience. These types of activities are socio-technical and are influenced both by the company's technology and customers.

Table 4.2. Overview of the challenges faced by IR in channel integration activities.

Channel Integration Activities	Challenges
Integrated Customer Service	The customer service level in the physical store is not being replicated in the online environment
Integrated Customer Traceability	Integration of data for tracking customers has been a challenge with the implementation of GDPR
Integrated Order Fulfilment	Inventory update is not real-time.
Integrated Promotion	Promotion is not consistent across channels.
Integrated Transactions	Innovative payment methods have not yet been adopted.
Integrated Information Access	There is no consistency of information availability between offline and online channels. The technologies in the physical store and website are not interoperable.
Integrated Reverse Logistics	Online and offline systems are not ready for returns. Returns from the other channel can only be handled manually.

Integrated Analytics	There is a need for a better connection with the customer for data Capture in physical stores.
Integrated Data Privacy and Security	A loyalty program needs to be designed considering data privacy and security.

4.3. Enabling Technologies for Channel Integration in Retail

Multiple digital technologies are required to achieve total channel integration in retail (Oh et al., 2012). Thus, it is necessary to clearly identify the most relevant technologies and solutions to support the retailers in the transition towards total channel integration to become omnichannel (Ardito et al., 2018). The role of digital technologies in facilitating channel integration activities identified in Section 3.3 is explained in this section. In Table 4.3, these relevant technologies are described. In Table 4.4, real-world implementation examples are presented.

Table 4.3. Description of Enabling Technologies for Channel Integration in Retail

Enabling Technologies	Description
Augmented/Virtual Reality	Augmented reality integrates computer-generated objects with the real environment and allows real-time interactions. (Juny & tom Dieck, 2018)
Blockchain	Blockchain technology consists of blocks that are linked through cryptography. (Aitzhan & Svetinovic, 2018)
Artificial Intelligence (AI)	AI augments human intelligence and for the context of this study, AI refers to machine learning, natural language processing, drones and other AI based systems. (Grewal et al., 2017)
Cloud Computing	Cloud computing allows sharing of IT software and hardware resources over the internet, so that information can be easily stored and accessed remotely by diverse actors. (Ardito et al., 2018)
Internet of Things (IoT)	IoT is a sophisticated network of objects and things connected to the internet. The concept of IoT in retail consists of Radio Frequency Identification (RFID), beacons, camera networks, and other wireless sensor networks. (Balaji & Roy, 2017)
Mobile Technologies	Mobile technologies refer to a set of technologies related to smartphones including mobile apps, scan and go, QR codes, location-based apps, etc. (Grewal et al., 2017)
Biometric Technologies	Biometric technologies are automated methods of verifying or recognizing the identity of a person based on their physiological

	or behavioral characters. (Tripathi, 2011)
Edge Computing	Edge computing refers to the enabling technologies allowing computation to be performed at the edge of the network, on downstream data and upstream data. (W. Shi et al., 2016)

Augmented Reality applications narrow the gap between online and offline shopping. They provide a sense of embodiment that results from natural interactivity and simulation of physical control over virtual offerings and sometimes exceeds what is possible in physical environments (Hilken et al., 2018). It is being used by firms like IKEA (Juny & tom Dieck, 2018) to provide better product information (integrated product and price information). Mister Spex, is providing, by using an AR virtual mirror, an experience where customers can virtually try on different glasses from their online assortment. Walgreens offers its customers "Aisle411" application to receive digital way-finding support that helps them locate products in the supermarket aisle (integrated customer service) (Hilken et al., 2018).

Blockchain offers attractive security features for distributed data processing and storage, especially when used with edge computing (Data Security and Data Privacy). Such systems are being implemented and developed in other industries such as health services. For example, using hierarchical identity-based cryptography for the handshake scheme. This scheme named as a cross-domain handshake (CDHS) scheme can be used to increase data security within integrated channels (integrated data security and privacy). Blockchain features can also be used for ensuring safe delivery to customers (integrated order fulfilment).

AI tools like machine learning extract the knowledge that is actually important in an omnichannel network. It helps the retailer to make sense of data by the transformation of raw data into information and then information to knowledge (integrated analytics) (Ardito et al., 2018; Iftikhar & Khan, 2020). AI-based fraud detection solutions like the ones proposed by (Hines & Youssef, 2018) can be used for detecting point of sales (POS) fraud when the system is integrated with other channels. Delivery technology based on AI such as drones facilitates the fulfilment process (integrated fulfilment). Facial recognition systems based on biometric technology are being used for identity verification e.g. Alibaba "pay with a selfie" (integrated transactions) (Smith, 2015). However, the use of biometric technologies in retail is significantly affected by regulations such as GDPR in the EU (Nabbosa & Iftikhar, 2020). Methods of using biometric technologies must evolve for compliance to GDPR and

sophisticated AI systems which can ensure the anonymity of the personal data processed can be a possible solution.

Cloud computing is devoted to storing raw data in structured information. Such information can be accessed by and exchanged between different channels, which may, in turn, use the structured information as the input for data analytics (integrated analytics) and customer assistant (integrated customer service) (Ardito et al., 2018). Cloud services also manage all types of raw data, but with the aim of storing structured information that may be helpful for logistics (integrated order fulfilment). Cloud computing based services can manage a multidirectional flow of information that can be used to support multiple activities like integrated product and price information, integrated promotions. Edge computing for IoT with blockchain can provide a transparent and secure alternative framework for private data management in digitally enabled physical stores (integrated data security and privacy) (Xiong et al., 2018).

IoTs play a vital role in multiple channel integration activities (Caro & Sadr, 2019). IoT solutions can be employed by retailers to acquire several types of data (e.g., the location of a component/product, customer data). Thereby, the data flow underlying IoTs combined with machine learning (AI) becomes a powerful resource for retailers to use for customer profiling (Integrated Analytics) and providing real-time recommendations (integrated customer service) (Balaji & Roy, 2017). Business to Thing Management based on IoTs can facilitate direct interactions with smart things and thus need-based promotions to the customer (integrated promotions). Edge computing is a viable way to take advantage of the explosion of the Internet of Things (IoT) which has dramatically increased the data load on networks. Integration of complex sensors, with the implementation of an efficient data fusion strategy can be used for integrated analytics and integrated customer traceability (Li et al., 2016).

Beacon is an IoT based technology that allows retailers to send messages or notifications to consumers in the beacon's zone to promote specific products (integrated promotions) or give recommendations (integrated customer service) (Fernie & Grant, 2015; Lemon & Verhoef, 2016). It is used by retailers such as Macy's, Zara and H&M for communications purposes with consumers (Fernie & Grant, 2015). Google announced the Physical Web initiative utilizing Bluetooth beacons as an IoT gateway and proximity-based service without the need for mobile apps. Beacon gateway can be used for analysing data from customer movements

in-store (integrated analytics). Data for tracing customers can be collected using software sensors (IoT) and smartphones (Integrated Customer Traceability). RFID is being used to track products in a store and during the delivery (integrated order fulfilment) as well from a distance by using tiny microchips hooked up to miniature antennas (integrated reverse logistics) (Hinkka et al., 2015). Retailers can use RFID to locate store inventory, keep track of inventory and products on the delivery route (Bonetti & Perry, 2017). By using RFID, retailers can provide customized marketing programmes (Integrated promotions) for the customers at an individual level and hence increases product and brand awareness (integrated product and price information) (Madhani, 2011).

Mobile technology is one of the main enablers of omnichannel realization (Bank, 2018). To provide services such as zero check-out vision systems can be combined with other technologies and provide integrated customer service. The touchscreen functionality of mobile devices can also be exploited to reduce the physical-digital divide between the in-store and online fashion shopping experience. The QR code, a two-dimensional matrix barcode, is a technology that is changing marketing in this decade. QR code can be used to provide integrated promotions and integrated products and price information. Using mobile ID tracking, retailers can use the consumers' smartphone's Wi-Fi to track their journey in the store and can know the repeat visitor and analyse the departments and parts of the store visited. Mobile Decision Support System can be used to check and compare reviews posted by consumers themselves and to extract the reputations of a product from weblogs (Groß, 2015). They might either retrieve data by scanning product barcodes or QR-codes with the mobile phone camera by using special m-shopping applications (Groß, 2015). H&M's have introduced a scan function in the mobile app that consumers can use in-store to scan the barcode of products and check their availability in other sizes and colours, as well as online promotions, personalized offers, and matching products.

Table 4.4. Overview of technologies and services for channel integration activities

Channel Integration Activity	**Enabling Technology**	**Examples of Implementation**
Integrated Customer Service	Cloud Computing, Augmented Reality, Mobile Technology, AI	Clarke's iPad feet measurement (Willems et al., 2017), Digitally Enhanced customer Assistant, Mobile Shopping Assistant, Walmart Product Finder, eBay Shopbot
Integrated Customer	Mobile	Tesco's Virtual coupons (Barnes & Distler, 2016),

Traceability	Technologies	Google Offline Attribution
Integrated Order Fulfilment	IoT (RFID), AI	Reserve and Pay (Hosseini et al., 2017), Click and Collect (Bell et al., 2014; Ma et al., 2014), Amazon Dash Button (Hosseini et al., 2017), Amazon Key Delivery, Amazon Anticipatory Shipping
Integrated Promotion	Mobile Technologies, Augmented Reality, IoT (Beacon)	Taggle, Viviono social communication (Hilken et al., 2018), Mobile Mirror (Willems et al., 2017), Location-based recommendations
Integrated Transactions	Mobile technologies, Biometric Technologies	Instagram Shopping (Dariswan & Indriani, 2014), Amazon Go (McFarland, 2018), Uniqul Payment, Alibaba 'Pay with Selfie'
Integrated Product and Price Information	Mobile Technologies, Augmented Reality	H&M Scan and Buy, Bauble Bar Interactive Display, Loreal Makeup Genius (Parise et al., 2016), Nike's product customization (Hilken et al., 2018)
Integrated Reverse Logistics	IoT (RFID)	Buy Online Return in Store, Return Collection from Home (Caro & Sadr, 2019)
Integrated Analytics	AI, IoT	Video based emotion Analytics (Tian et al., 2018)
Integrated Data Privacy and Security	Blockchain, Edge Computing	Automated access control manager (Zyskind et al., 2015)
Integrated Fraud Detection	AI, Biometric Technologies	POS Fraud Detection (Hines & Youssef, 2018)

Several interesting findings have emerged from this mapping. First, IoTs, mobile technologies and AI are required for most channel integration activities, as shown in Table 4.4. Still, other technologies, such as blockchain and edge computing, can substantially create value through channel integration. These are not required for numerous activities like the former but are critical for the particular activities they support. Edge computing is a viable way to take advantage of the explosion of IoTs, which has dramatically increased network data load. The integration of complex sensors, with the implementation of an efficient data fusion strategy, can be used for several services, leading to better service, more sales, and lower costs (Lemon and Verhoef, 2016). For example, Boucouvalas et al. (2016) proposed an integrated analyser for real-time analytics for the physical store and online store

using mobile technologies and communication techniques commonly used in e-commerce applications, thus supporting hybrid systems. This method offers much better service to traditional brick-and-mortar shop customers. Another important finding from our study was that some services are being employed in other domains using the identified technologies that can be easily replicated in the retail sector but are not being implemented. For example, a cross-domain handshake scheme proposed for the healthcare sector can be used for data security while moving data from one channel to another. Similarly, sophisticated machine learning is used in financial services for fraud detection, which can be easily adopted in retail. An ideal position for a retailer would be complete customer data integration (CDI) and a single view of the customer across channels. In the context of omnichannel retailers, facial recognition or other biometric technologies can be used as a unique identifier to identify customers across different channels, but there are regulatory and cultural ramifications of using these technologies which must be taken into account. For example, biometric data can only be processed in the EU if consent is given explicitly.

4.4. Summary

The main objective of the problem identification phase was to identify the challenges faced by IR in ensuring flow experience. In this chapter, we first discussed customer-retailer interaction in the context of IR. The challenges in channel alignment and designing interactions are presented next. We identified channel integration activities and enabling technologies to improve the understating of channel integration challenges at IR. The cross-channel interaction challenges faced by IR are summarised as: i) the disconnection between touchpoints across the different channels and their underlying systems to support flow experience; ii) the lack of a holistic design perspective to create alignment and flow along the customer journey); iii) the limitation of conventional design and evaluation approaches. We propose a design framework in the next chapter to address these challenges.

Chapter 5

Framework Design

This chapter presents the development of the design framework to address the challenges identified in Chapter 4. We identified that the cross-channel interaction issues faced by retailers are: i) the disconnection between touchpoints across the different channels and their underlying systems to support flow experience; ii) the lack of a holistic design perspective to create alignment and flow along the customer journey; and iii) the limitation of conventional design and evaluation approaches.

This chapter introduces a multi-level design framework (omniflow framework) that facilitates a low-level integration of different design levels and enables effective utilization during the design process. This chapter also describes in detail the elements of the design framework and the linkage between these elements. It explains the system, encounter, and evaluation design concepts that ensure a positive flow experience for omnichannel retail customers. The design framework is created based on the learnings from the literature and the experience of working with IR.

5.1. Framework Overview

According to the servicescape perspective, managers are consistently involved in the planning, constructing, and modifying of the retail environment to regulate consumer behaviour (Boak, 2021). Therefore, we propose the omniflow framework, which enables managers to create and adjust the shopping environment across various channels and touchpoints to establish a smooth and uninterrupted customer shopping experience. The proposed design framework (Figures 5.1 and 5.2) for enhancing the flow experience involves three stages. The first step consists of designing the system to facilitate the flow experience. A system design model (Section 5.1) is developed for this step of the design process, which can be viewed as an integrated whole that enables retailers to provide the flow experience. The second step is to design the individual encounter and understand how the information is

exchanged between the retailer and the customer. Encounter design (Section 5.2) is based on information architecture, enabling retailers to link one part of the customer journey with the next. The third step is to design the tool to analyse the change in flow experience. An assessment design model that enables retailers to analyse and monitor the flow experience is developed for this step.

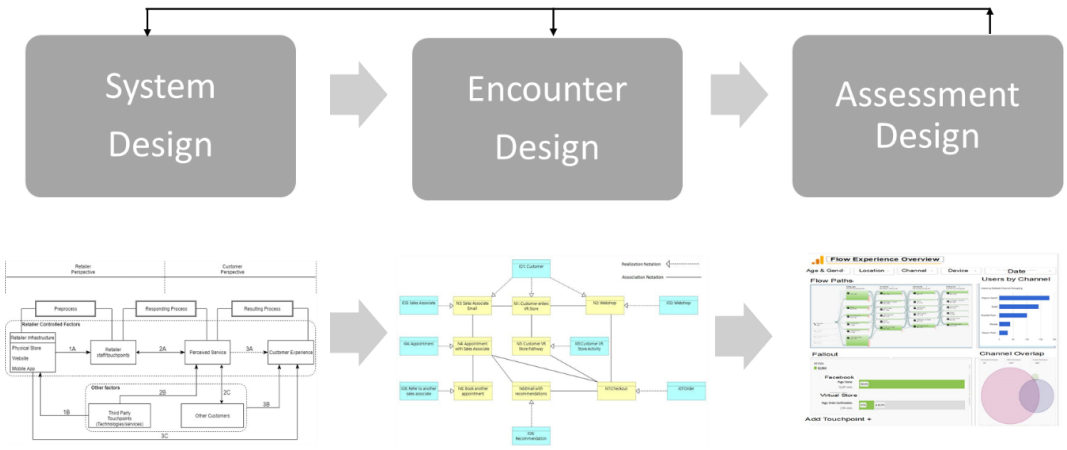


Figure 5.1. Omniflow Design Framework Overview

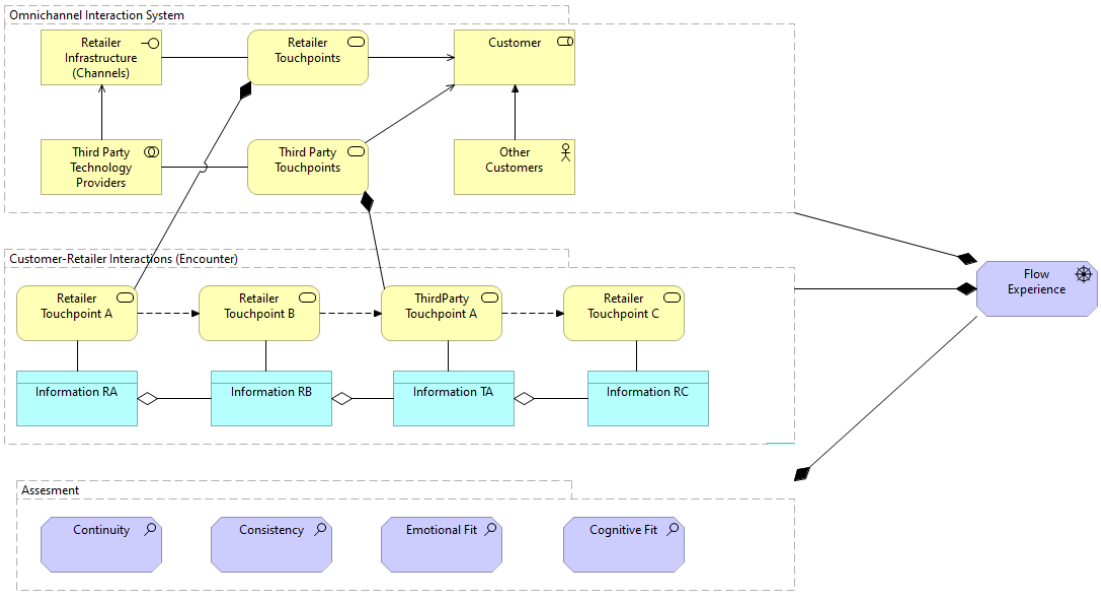


Figure 5.2. Omniflow Design Framework in ArchiMate

5.2. System Design

This Section presents the proposed model for designing customer-retailer interactions at the system level, which combines the customer and retailer perspectives.

The proposed system design has its foundation in activity theory, as described in Section 2.4.2. Activity theory focuses on activity systems comprising interconnected elements that work together to achieve a goal. In the proposed model, the customer-retailer interaction system can be seen as an activity system, with various actors and touchpoints working together to create the customer experience. By understanding the various elements of the system and their relationships, designers can identify areas for improvement and design more effective interactions.

Customers' experiences are influenced not only by their direct interaction with the retailer but also by various other touchpoints within or beyond a retailer's control (Kranzbühler et al., 2018). Activity theory emphasizes the importance of understanding the broader social and cultural context in which activities occur. In the proposed model, understanding the context in which customer-retailer interactions occur is critical to designing effective interactions. This includes understanding the various touchpoints that customers can use while in the customer journey involving the retailer, as well as the broader social and cultural factors that may influence their perceptions and experiences. Therefore, when designing interactions and assessing how these interactions and customer journeys are perceived, a firm must consider all the actors involved in this network. The model in Figure 5.3 captures the relationships that determine the creation of customer experience based on the different interactions and relationships between the parties involved.

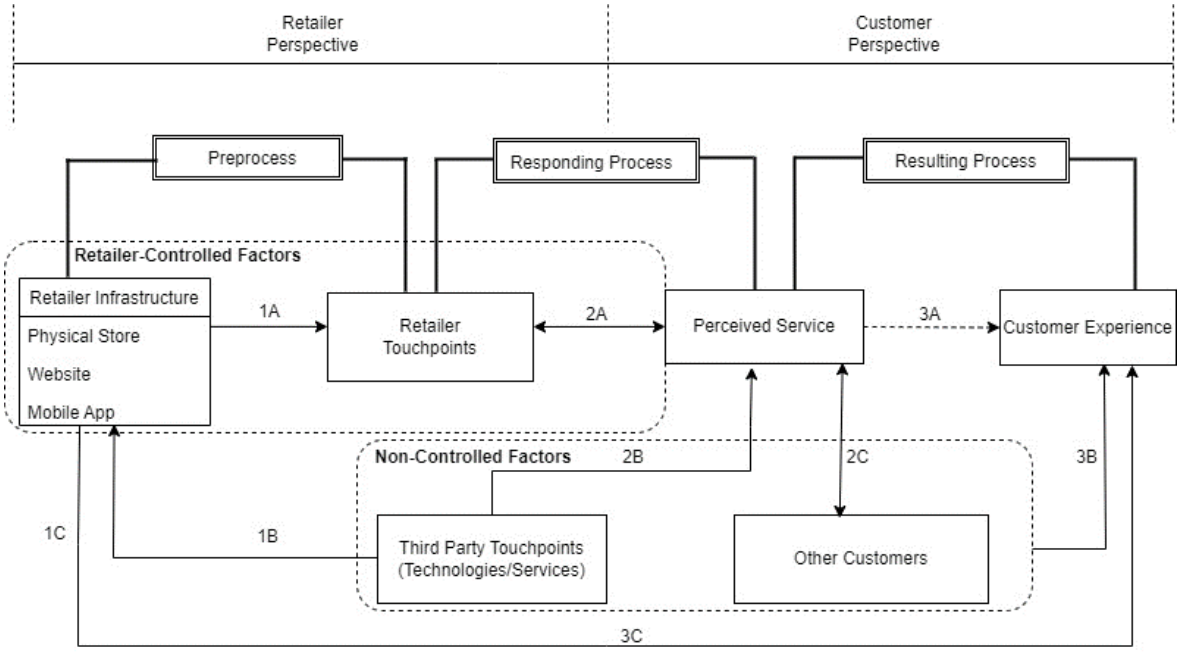


Figure 5.3 Omnichannel Interaction System Design

5.2.1. Pre-process (1A, 1B and 1C)

1A refers to the utilization of the retailer's infrastructure by its employees and technology interfaces to provide better service to the customers. Employees' help from other sources, such as technology, positively impacts their engagement with customers (Stock et al., 2017). The technology interfaces are dependent on the backend infrastructure as well.

1B implies that the third-party touchpoints can create a better experience indirectly, for example, by providing an opportunity to reach out to retailers. A third-party web search page can provide information regarding the retailers' timing, assortment, promotions, etc., which makes it easier for customers to get familiar with a certain retailer and thus get a positive experience. Retailers need to adapt their interaction's design to harmonize these with the complimentary third-party providers those customers might use before or after a direct interaction. If the retailer wants to facilitate customers' use of many different complementary services provided by third parties, the internal processes of the organization need to be more flexible to allow for this technological variability. There are different third-party applications and services for customers that directly affect their perceived experience with retailers. Better alignment of retail infrastructure with third-party touchpoints can lead to better-perceived service in the customer's eye. Customer experience includes both brand-controlled and brand-earned touchpoints (i.e., touchpoints beyond firms' control, such as Instagram pictures posted by customers) and additionally entails social responses (Kuehnl et al., 2019).

1C refers to the previous experience of a customer with the retailer's infrastructure and the knowledge gained and expectations formed based on that experience.

5.2.2. Responding Process (2A, 2B and 2C)

The process in 2A reflects customer interactions with retail staff and direct technological touchpoints such as self-service technologies. Frontline encounters are of key importance to any retail organization as it forms the boundaries between the company and its customers (Singh, 2017). In "high-touch, low-tech" encounters, frontline employees represent the key factor driving successful encounters by building pleasing and rewarding social relations (Giebelhausen, 2014). In particular, if products are moderately priced, somehow hedonic, and chosen by a customer's particular preference, the interaction between a shopper and a staff on a shop floor plays an important role in the sales process (Kurata, 2019). These interactions can be initiated either by firms or by customers. Firm-initiated contacts are interactions that the company begins in order to communicate with its customers and stimulate future customer behaviours. Firm-initiated contacts can take the form of a direct approach to a customer when in-store, through e-mail, via chat, etc. Customer-initiated interactions are primarily used for information seeking or support and take the form of call centre calls, web enquiries, etc. Although customers do not always interact with the same staff and may not build a positive relationship with the employees, they might nevertheless develop certain expectations about the service based on previous interactions with the retailer. Therefore, the consistency of experience from all employees is pivotal in ensuring a positive customer experience. This is based on the social exchange theory explained in Section 2.4.2.

2B is the effect on perceived service through using third-party technologies and services. Technology advancements have enabled third parties to become a natural part of the customer experience process.

2C is the contact with other customers (social experience) during the customer journey. For example, a customer can discuss their needs on social media, where someone can recommend a certain retailer or service and share personal experiences. Moreover, the customer's opinion expressed on social media also affects the choice and expectations of potential customers. Online posts, word of mouth, dissatisfaction, complaints, etc. contribute to the customer's expectation from the retailer and can influence either positive or negative perception of a brand. Therefore, the ease of access customers have to other customers

greatly impacts perceived service and should be among the major considerations for retailers when it comes to designing the customer experience. The social experience of customers within a retail environment involves interactions with both known and unknown customers. Customers compare themselves to others and perceive similarities, making them feel more comfortable. However, the presence of strangers may discourage customers from raising complaints. Negative social experiences may arise due to factors such as crowding, proximity, eye contact, or appearance, as well as other disruptive behaviours. Conversely, customers may experience positive effects from interacting with other customers, such as social support, information sharing, and help and assistance. Customer experiences can also be about socializing and meeting people in addition to making purchases or seeking information. For example, shopping with family and friends increases the likelihood of a purchase.

In summary, the social experience of customer interaction within the service environment is influenced by a variety of factors, both positive and negative, that can affect the customer's perception of their experience. Retailers must consider the social context of customer experience and design environments that foster positive social interactions while minimizing negative ones to improve customer experience.

5.2.3. Resulting Process (3A, 3B and 3C)

Phase 3A in the model represents the transition between the instances where customers perceive a certain service provided by the retailer and the customer experience that follows. Positive perceived service is a critical factor that differentiates the customer experience of one organization from another. Perceived service in an omnichannel context cannot be evaluated in isolation. Whereas facilitating a positive perceived service can be a top priority for retail companies, we argue that recognizing that the outcomes of such instances can have an aggregated effect on the customers' overall experience with the retailer.

In the system design, it is important to recognize that customer experience is a subjective phenomenon that can only be fully understood by knowing the context of the customer interacting with and perceiving the offering uniquely. The meaning of the customer experience is created from the customer's own personal context, which is influenced by their social world and historical meanings. The customer context can be described as the individual context, which is a transient personal state that evolves and changes across the customer journey. The customer's overall ways of thinking, emotional state, and past

experiences will all have an impact on the realized experience they have. Demographics such as age, gender, and culture also have an impact on customer experience. Cultural aspects such as signs and symbols, structures, and practices also influence the way customers integrate various resources and the experiential responses they have because of this process. This is supported by several studies discussed in detail in Chapter 2 that suggest that omnichannel usage is affected by customer characteristics.

3B refers to customers' use of third-party technologies associated with various channels, such as websites, mobile apps, social media pages, retail stores, etc. Each of these channels offers a unique experience to customers. Webrooming and showrooming are two famous examples of the frequent interaction sequence customers form when doing cross-channel shopping (Flavián et al., 2019). Webrooming sequences usually consist of two episodes. In the first episode, the customer searches for and finds a product that best matches his or her needs; in the second episode, the customer visits the physical store to touch, feel, or test the products and makes the purchase (Arora & Sahney, 2017; Flavián et al., 2019). Showrooming is a similar concept but with information search and purchase channels opposite to webrooming. Experience-centric service providers create the prerequisites that enable customers to have the desired interactions. Therefore, in the case of webrooming or showrooming mentioned above, the experience-centric retailer will provide its customers with the option to switch/hop channels as wished and as is convenient for them. 3B also reflects how other customers' behaviour influences the customer experience. For example, a customer might not directly interact with the staff, but staff engagement with other customers also influences the overall customer experience. In sum, these interactions should be considered a powerful and important resource for customer experience creation.

3C refers to the atmospheric experience that customer encounters due to the retailer's infrastructure. This experiential dimension is rooted in the ambiance, sensory elements, and environmental factors that envelop customers during their interactions with the different elements of the retailer's infrastructure in their customer journey. The atmospheric experience interweaves with the broader context of a customer's journey, as described in Phase 3A. It aligns with the individual's context contributing to the creation of a holistic customer experience.

In summary, system design considers the continuous development of the customer journey, from initiation to ultimate customer experience, with the key touchpoints that help facilitate customer-retailer interactions and lead to the creation of a positive customer experience depicted along the model. A well-developed system design will ensure that customers' expectations are effectively integrated with retailer-provided experiences at all touchpoints. Advanced technology provisions should be provided, keeping in mind the primary target customer of the retailer. Finally, retailers should make sure they are protecting personal information when collecting it throughout this process.

5.3. Encounter Design

Once the coordination of various components of the interaction system has been determined, as shown in Section 5.2, the next step is to develop a detailed plan for each encounter. Encounter design is based on IA concepts explained in Section 2.4.4. The use of IA in omnichannel retail design ensures a consistent and continuous experience across different touchpoints in different retail channels, such as a retailer's website, mobile app, and physical store. From the customer's perspective, the right information at the right time plays a crucial role in ensuring that customers can easily find what they need and navigate between different channels without getting lost or confused.

The content (information object) required for information exchange as the customer moves between different touchpoints in their journey to ensure flow concerns the meaning of the information, its format, and where it is captured, utilized, and shared (Tan et al., 2013). Additionally, context (norm object) is captured as it identifies the event that initiates the exchange of information and the actor and their motivation for using the information. Based on this categorization, six dimensions of information requirements are identified for each touchpoint activity. These dimensions include the user of the information, the content of the information, the way the information is presented, the location in which the information is stored, the time the information is required, and the reason the information is needed for that particular activity. Table 5.1 shows the information requirements for the encounter design.

Table 5.1 Information Requirements

Information Requirement					
Who	**Why**	**How**	**Where**	**When**	**What**
Actor (e.g., customer, sales associate)	Meaning (e.g., the type of information about the customer such as device used, geographic location, etc.)	Representation (e.g., format of information)	Location (e.g., database)	Event (e.g., customer completes an order)	Value (e.g., the actual value associated with information type)

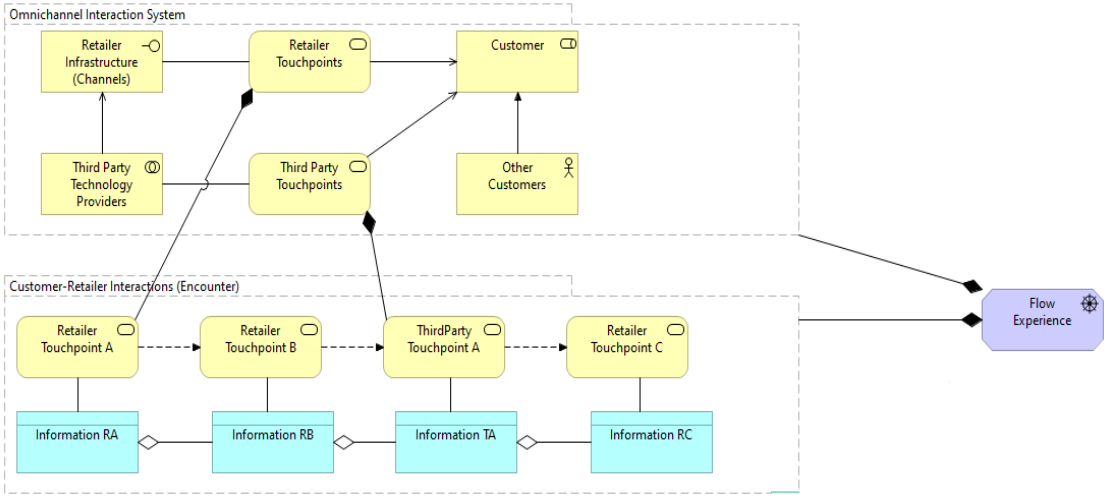


Figure 5.4 Linkage between encounter and system design in ArchiMate

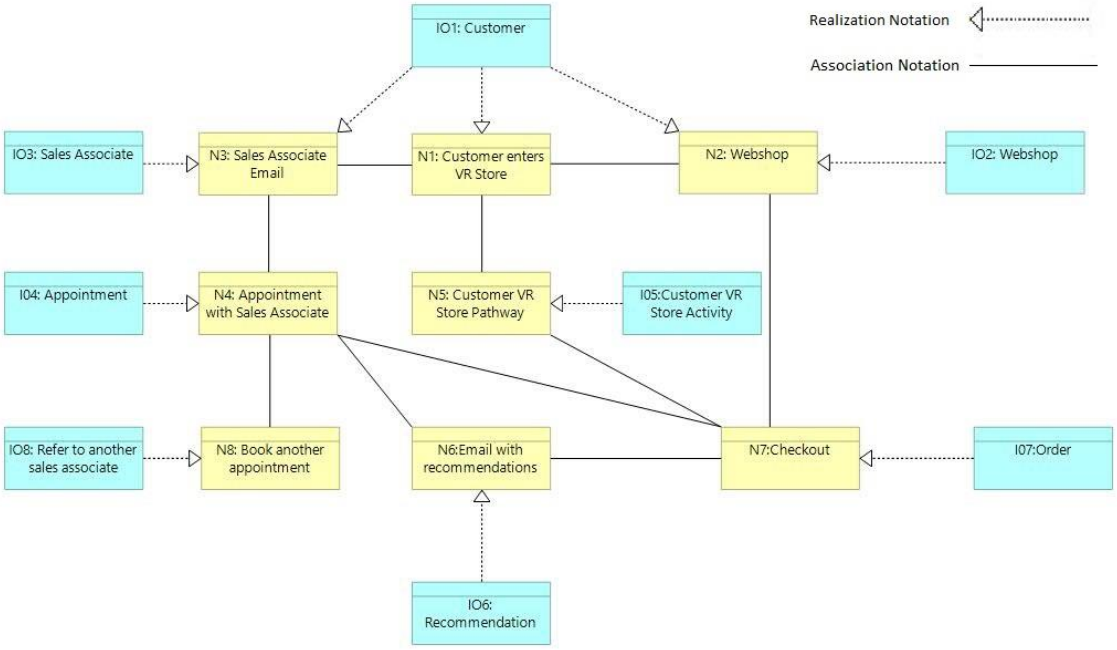


Figure 5.5. Information architecture for remote salesperson service using a VR store in ArchiMate

The required norm and information objects are obtained from the gathered information based on the activities for that particular encounter. These objects are combined in encounter design, as illustrated in Figure 5.4. The norm objects refer to the touchpoints that include actors and events, which are then realized by information objects that encompass meaning, representation, location, and value. There are two types of information objects, R(x) representing the touchpoints controlled by the retailer and T(x) representing the third-party touchpoints. The ArchiMate notation and relationship between concepts are used to model the encounter design, where data objects and business objects in ArchiMate represent norm and information objects, respectively. Figure 5.5 displays the connection between information objects and norm objects arising from the activities conducted in the VR store's remote salesperson service. This is explained in more detail in Section 6.2.2.

IA also enables the sharing of information between different stakeholders in the retail ecosystem as reflected by information objects consisting of both the retailer and third-party touchpoints. In the context of the omnichannel shopping experience, an information-sharing mechanism that supports customers' cross-touchpoint information retrieval refers to a platform that allows both customers and retailers to access and retrieve information as they move between different channels during the customer's shopping journey.

IA-based encounter design facilitates a continuous and consistent shopping experience by enabling customers to access and retrieve relevant information as they move between

touchpoints controlled by third parties (e.g., social media) and retailer-controlled touchpoints (e.g., retailer's website). One common example of this would be facilitating social media account sign-in on the retailer's website, which, in turn, empowers the retailer to deliver a personalized and relevant shopping experience during the transition. These examples are explained at length in Section 6.2. By accessing the information that customers have previously provided on social media, the retailer can make the journey continuous and consistent as the customer will not have to provide the same information again and will receive personalised interaction that results in a frictionless journey.

Based on the above, the use of IA in encounter design will ensure the following for retail customers:

1. Retrieve and exploit information acquired in touchpoint A when the customer moved to touchpoint B.
2. Experience unbroken flow along any channels or touchpoints

5.4. Assessment Design

In this section, an assessment design model is proposed for evaluating flow experience in the omnichannel environment. This model aims to provide a basic outline for evaluating flow experience in the omnichannel environment and how these elements are interconnected. When developing an assessment for flow experience, it is important to consider the interconnection of the customer journey because the customer's experience does not begin and end with a single interaction or touchpoint with the company.

Flow experience in omnichannel retail includes three main dimensions: continuity, consistency, and constancy of emotional and cognitive fit. These dimensions are discussed in Section 2.1.3. The assessment constructs for evaluation flow experience are developed along these dimensions, as shown in Table 5.2.

Table 5.2. Assessment Metrix for flow experience

Dimension	Assessment Construct	Data Source
Continuity	Flow paths Fallout Link transition speed Accessibility of transition links	Website usage data, social media usage data, search engine data, in-store footfall data, POS data, web checkout data

	Visibility of transition information	Response time data (Website, in-store QR/bar codes) Performance monitoring, Uptime of links Customer feedback
Consistency	Users by channel Product price consistency Product description consistency Payment/voucher acceptance consistency	Website usage data, social media usage data, search engine data, in-store footfall data,
Constancy of Emotional and Cognitive Fit	Channel overlap Transition effort score (ease of Transition) Path length	customer feedback, website usage data, social media usage data, search engine data, and in-store footfall data

5.4.1. Continuity Assessment

To evaluate the continuity of the customer journey, we propose flow paths, fallout, link transition speed, accessibility of transition links, and visibility of transition information as the main constructs. These constructs enable retailers to know the capacity of their system and the design of their interactions to allow omnichannel customers to migrate and continue on tasks across channels and the time used to complete the task. The constructs for evaluating continuity and possible data sources for each are discussed below.

Flow Paths

Flow Paths show all the unique conversion paths and sequences of channel interactions that led to conversions, as well as the number of conversions from each path and the value of those conversions. This allows retailers to see how channels interact along conversion paths. Each path populates the channels through which a user arrived during the lookback window prior to each conversion the user completed. The data sources for the flow path include website usage data, social media usage data, search engine data, in-store footfall data, POS data, and web checkout data.

Fallout

Fallout represents a metric of user drop-off, the percentage of customers who leave without converting. It is an essential component of conversion tracking that allows retailers to

analyse the effectiveness of their channels, diagnose performance issues, and make improvements to their customer journey. The data sources for fallout include website usage data, social media usage data, search engine data, in-store footfall data, POS data, and web checkout data.

Link Transition Speed

Link transition speed is a measurement of how quickly a user can move from one channel to another. Response time data, performance monitoring, and uptime of links can help retailers identify any bottlenecks and performance issues and optimize the speed of transition between channels. The data sources include response time data (website, in-store QR/bar codes), performance monitoring, and uptime of links.

Accessibility of Transition Links

The accessibility of transition links is the measurement of the ease of access to transition links across different channels. This is a critical metric for retailers to optimize their channels, and customer feedback can provide valuable insights into how easy or difficult it is for customers to navigate between channels. The data source is customer feedback.

Visibility of Transition Information

The visibility of transition information is the measurement of the availability of transition information for customers moving between channels. Retailers must ensure that customers can access relevant and timely information as they move between channels. Analysing website usage data, social media usage data, search engine data, in-store footfall data, POS data, and web checkout data can provide insights into how retailers are performing in this regard.

5.4.2. Consistency Assessment

Consistency across channels is critical in maintaining flow and reducing friction during the customer journey. In this section, we propose four constructs for assessing consistency: users by channel, product price consistency, product description consistency, and payment/voucher acceptance consistency.

Users by Channel

Users by channel is a metric that quantifies the number of users engaging with each channel. This measurement provides retailers with valuable insight into the customer journey,

allowing them to discern how each channel contributes to the flow experience and whether the channel usage ratio aligns with their desired outcomes. Retailers can leverage website usage data, social media usage data, search engine data, and in-store footfall data to collect and analyse data on users by channel.

Product Price Consistency

Product price consistency is a measurement of the consistency of product prices across different channels. Retailers need to ensure that product prices are consistent across all channels to avoid customer confusion and to maintain trust. Retailers can leverage website usage data, social media usage data, search engine data, and in-store footfall data.

Product Description Consistency

Product description consistency is a measurement of the consistency of product descriptions across different channels. Retailers need to ensure that product descriptions are consistent across all channels to avoid friction and maintain a flow between channels. Retailers can leverage website usage data, social media usage data, search engine data, and in-store footfall data.

Payment/Voucher Acceptance Consistency

Payment/voucher acceptance consistency is a measurement of the consistency of payment and voucher acceptance across different channels. Retailers need to ensure that payment and voucher acceptance is consistent across all channels to avoid friction between channels. Retailers can leverage website usage data, social media usage data, search engine data, and in-store footfall data.

5.4.3. Cognitive and Emotional Fit Assessment

The assessment matrix for cognitive and emotional fit measures the retailer's capacity to design interactions that maintain the same level of cognitive and emotional engagement after the transition of the activity to another channel or touchpoint. This construct is critical to assess as it ensures customers remain engaged irrespective of the channel.

Path Length

It measures the length of the customer journey and the number of touchpoints involved in completing a task. This construct is important to measure as longer paths can lead to customer fatigue and frustration, whereas shorter paths can lead to a more seamless and

satisfying customer experience. The path length report provides an overview of conversions resulting from conversion paths containing various numbers of channel interactions, ranging from one to twelve or more. Data sources could include customer journey data collected through web analytics tools, such as Google Analytics or Adobe Analytics, or data from customer feedback surveys that ask about the number of touchpoints involved in completing a task.

Transition Effort Score (Ease of Transition)

The transition effort score measures the effort required by customers to transition between channels. Retailers can measure this construct through customer feedback or by analysing the number of steps or clicks required to complete a task across multiple channels. This construct is crucial to monitor, as high transition effort scores can lead to friction, whereas low scores indicate flow.

Channel Overlap

Channel overlap measures the extent to which customers use multiple channels to complete a task. Retailers need to track channel overlap to identify any overlaps or redundancies in the customer journey. The data sources for this construct include website usage data, social media usage data, search engine data, and in-store footfall data.

5.5. Design Principles

Eight design principles shown in Table 5.3 were developed first as a result of the literature review and experience gained by working with retail designers to develop and refine new service interactions. After formulating the initial eight design principles, we evaluated these principles by conducting interviews and focus groups as explained in Section 3.4. Based on the analysis of the results, we modified three of the initial eight design principles (DP1, DP2, and DP10) and added two more principles (DP4 and DP7). This research process helped ensure that the principles were based on a solid knowledge foundation and reflected the best practices from the industry.

Two new design principles were added in the final set, DP4 (Seamful) and DP7 (Reduction). DP4 (Seamful) emphasizes the need to include cues and reminders for points of departure to other channels/touchpoints clearly to avoid confusion. The addition of DP4 'Seamful' was based on the feedback in the focus group. There was a consensus on making the transition

clear where needed to facilitate the sense or orientation in the customer journey, with the customer being aware of the possible transition options. One of the participants stated, “Our users have indicated multiple times that they found it confusing to understand when and how to move between touchpoints." This result from the focus group was also supported by literature, as Lacerda et al. (2019) also emphasised that the presence of seams should be leveraged to enhance clarity in the navigation of the ongoing journey. DP7 (Reduction), which focuses on facilitating the movement of tasks between channels with minimal overhead, was also included in the final design principles. The feedback received from the focus groups expressed the need for a principle focused on ensuring as little effort as possible is required from the customer when moving between channels. A participant stated users found it frustrating to switch between channels without the carrying over of their completed tasks. For example, the information asked from a user in one channel should not be requested again, and the design should support once-only information gathering.

Additionally, we modified three design principles. We modified DP1, as we received the feedback from the focus group that “you'd have to take elements from the information architecture, of course. But I don't think that should be a […] central point of the principle.” Further, DP10 was modified as the participants mentioned that the theme of consistency is present in other design principles. For example, one participant stated, “Consistency applies to multiple principles, so having consistency repeated for a single principle makes it confusing.” Thus, we changed the DP10 to "Uniformity", highlighting the importance of providing a uniform interface or similar object manipulation across channels to ensure that customers experience the same aspects of features across different channels. DP2 was modified to explicitly mention that correlation extends to data.

The design principles for flow experience complement the design framework (presented in Section 5.1) by providing a set of guidelines that can be incorporated into the design process. The design framework provides a structured approach to design, while the design principles for flow experience provide specific guidelines for what needs to be considered at each stage of the design process. For example, the design framework outlines the steps for designing the information architecture, while the design principles for flow experience provide specific guidelines on how to ensure that the information architecture supports seamless customer transitions between channels.

Incorporating the design principles for flow experience into the design framework is essential to ensuring that the customer journey is designed with the customer's needs in mind. The design principles help to ensure that the design framework is optimized. The design principles for flow experience are an important aspect of the design framework, as they help to ensure that the customer journey is optimized for customer satisfaction and success. All the final ten design principles are interrelated and complement one another and might not achieve the desired outcome if applied in isolation. These design principles provide a set of guidelines that help to ensure that the customer journey is as frictionless as possible.

Table 5.3 Initial design principles

DP#	Design Principle	Design Principle Specification	Omnichannel Customer Experience Dimensions
1	Interoperability	The information architecture design supports customers' need for overall portability between channels	Continuity of the task
2	Correlation	The design should not cause a customer to lose progress or have to redo work already done in another channel.	Continuity of the task
3	Place-making	The design supports the customers' orientation during the interaction when switching from one channel to another channel.	Continuity of the task
4	Resilience	The design of information architecture should enable task flow between channels to reflect the customer's view of the journey.	Constancy of emotional and cognitive fit
5	Actionable	The sequence of steps matches the user's mental model so the customer can take appropriate actions.	Constancy of emotional and cognitive fit
6	Navigable	The design supports the customer's overall understanding of how to move from one channel to another channel.	Constancy of emotional and cognitive fit
7	Composition	The design supports the customers' understanding of task structure and logical flow with consistency and compliance of task structure across channels.	Consistency of the content

8	Consistency	The design should provide the same type of interface or similar object manipulation consistently so the customer experience the same aspects of features across channels.	Consistency of the content

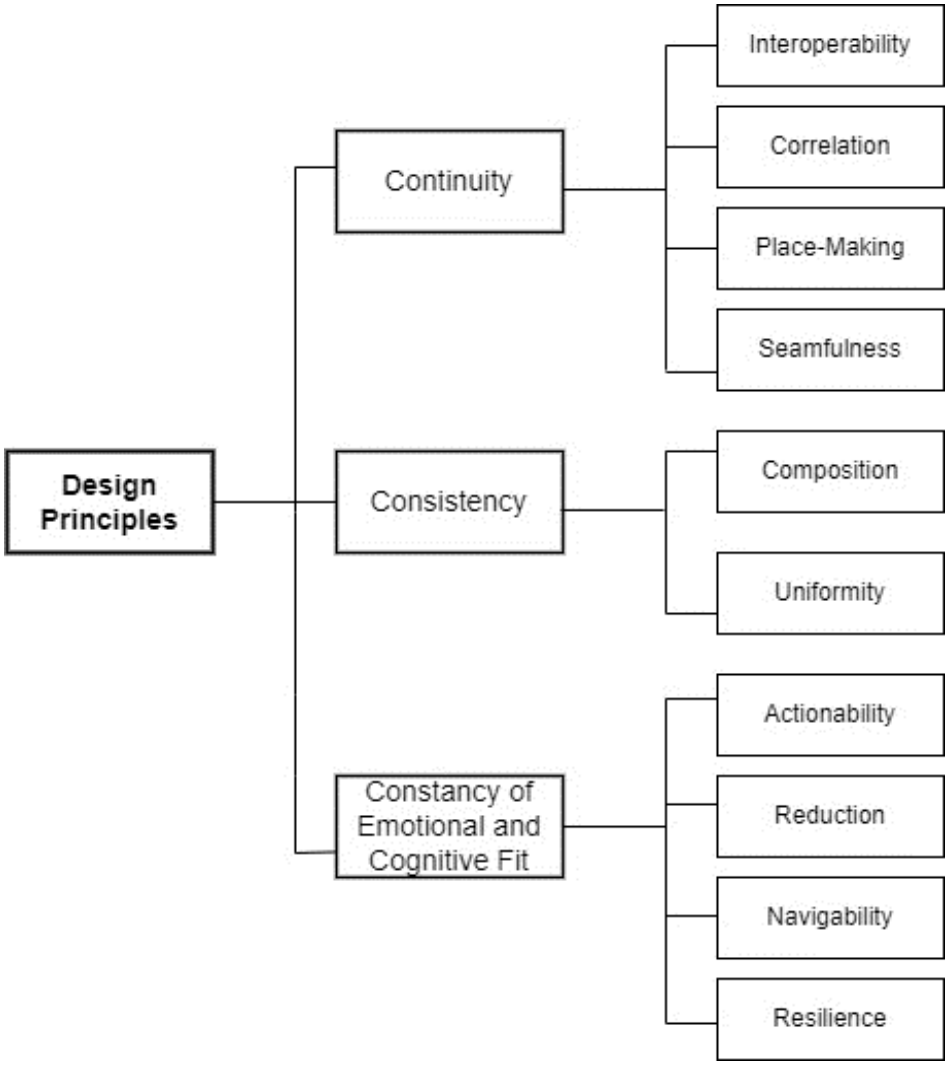


Figure 5.6 Design principles for flow experience

5.5.1. Definition of Design Principles

DP1 – Interoperability

The design facilitates the portability of tasks between channels.

The objective of this design principle is to provide customers with a flexible and adaptable experience as they navigate through the customer journey. This requires designing the

system in a way that allows for different methods of interaction, including different channels, devices, and platforms. A flexible and adaptable experience allows customers to engage with the customer journey in the way that works best for them, whether they prefer to interact through a desktop website, mobile app, or in-store experience.

To implement this design principle, it is important to consider the different ways that customers may prefer to engage with the customer journey and to design the system in a way that supports these different methods of interaction. This may involve designing the system to be responsive and adaptable to different devices and platforms and ensuring that the information architecture is flexible enough to support different methods of interaction. Additionally, it is crucial to ensure that the system design supports interoperability by allowing customers to move smoothly from one channel to another without losing their progress in the customer journey.

DP2 – Correlation

The design prevents loss of progress or repetition of work done in another channel.

The objective of this design principle is to create an integrated and cohesive experience for customers as they navigate through the different stages of their journey. This includes ensuring that the flow is uninterrupted and that the different parts of the journey are connected, allowing customers to switch from one part to the next easily. Flow experience requires that the different parts of the customer journey are well-coordinated and aligned with one another, ensuring that the customer experience is smooth and consistent.

To incorporate the principle of correlation into the design framework, the encounter design based on information architecture must be developed in a way that does not cause customers to lose progress or have to redo work already done in another channel and requires designing the individual encounters and how information is exchanged between the retailer and the customer, ensuring that the different parts of the customer journey are linked and that the customer is able to switch from one part to the next easily.

Additionally, it is important to ensure that the system design supports the principle of correlation, allowing customers to move smoothly and easily from one part of the journey to the next. The principle extends to establishing a connection or relationship between data across different points of interaction.

DP3 - Place-Making

The design supports the customers' orientation during the interaction when switching between channels.

The objective of this design principle is to provide a sense of orientation and familiarity to customers when they switch from one channel to another in a multi-channel experience. This principle is concerned with ensuring that the design of the system supports the customers' ability to navigate and understand the flow of their interactions and activities as they move from one channel to another.

To incorporate the principle of place-making into the design framework, the design must support customers' orientation during the interaction when switching from one channel to another. This can be done by providing visual cues, such as recognizable logos or navigation elements, that help customers understand where they are and what they are supposed to do.

DP4- Seamfulness

The design enables the presence of possible multiple points of departure to other channels/touchpoints clearly to avoid confusion.

The design should provide clear and meaningful feedback to customers during their task flow to keep them informed of possible departure points, ensuring that the customer is aware of the tasks already completed. This will help reduce confusion and frustration for the customer, making the overall flow experience more efficient and effective.

Incorporating this principle into the design framework requires careful consideration of the customer's journey and the information that needs to be carried over between channels. The design should provide cues for customers to ensure that they are aware of the possible departure points to other channels and can continue smoothly from where they left off. Additionally, the design should also consider the customer's needs and preferences, ensuring that the reminders and cues provided are helpful and relevant to the customer's situation.

DP5- Resilience

The design enables task flow between channels to align with the customer’s view of the journey.

The design should enable adaptation and handling of changes or unexpected events in a way that does not negatively impact the customer's experience. The aim is to create an experience that is flexible and can adjust to different situations while still maintaining a high level of quality and reliability.

To incorporate the principle of resilience into the design framework, the sequence of steps must match the customer's mental model so that they can take appropriate actions. This can be done by designing the system to reflect the customer's view of the journey and enable them to move easily from one channel to another.

DP6- Actionability

The design aligns the sequence of steps with the customer's mental model to enable appropriate actions.

The "Actionability" design principle refers to the idea that the sequence of steps involved in a customer's flow experience should align with their mental model. This means the customer should be able to take appropriate actions easily and without confusion. This principle is important because it helps to ensure that the customer's flow experience is positive and that they can complete tasks effectively and efficiently. When the steps during the customer journey match the customer's mental model, it becomes easier for them to understand how to proceed, reducing the risk of frustration or confusion.

To incorporate the principle of actionability into the design framework, the information architecture must be designed in a way that facilitates moving tasks across channels with minimum or no overhead. This can be done by ensuring that the information architecture is intuitive and easy to understand, allowing customers to easily find the information they need and complete their tasks.

DP7- Reduction

The design facilitates the movement of tasks between channels with minimal overhead.

This principle is focused on reducing the friction and burden on the customer when switching between different channels. The design should enable smooth and seamless movement of the task without adding any unnecessary steps or processes. This principle is crucial as it

helps to increase the overall efficiency and effectiveness of the flow experience by reducing the time and effort required by the customer to complete the task.

To incorporate the principle of reduction into the design framework, the design should facilitate moving tasks across channels with minimum or no overhead. This can be done by ensuring that the encounter design is streamlined and efficient, reducing the number of steps required to complete a task and minimizing the amount of time and effort required by the customer.

DP8 - Navigability

The design provides customers with a clear understanding of how to move between channels.

The design principle of navigability focuses on supporting an overall understanding for the customer of how to move from one channel to another. This means that the design should provide clear and intuitive navigation options that allow the customer to easily move between different channels, without having to worry about losing progress or having to redo work.

To incorporate the principle of navigability into the design framework, the design should support an overall understanding for the customer of how to move from one channel to another. This can be done by providing precise and concise navigation elements, such as menus or breadcrumb trails, allowing customers to find their way around more easily in transitioning to the new channel.

DP9 - Composition

The design supports the customer's understanding of task structure and logical flow through consistency and compliance of the task structure across channels.

The design principle of composition supports the customer's understanding of task structure and logical flow, with consistency and compliance of task structure across channels. This means that the design should present the customer with a clear and structured view of the task.

To incorporate the principle of composition into the design framework, the design should support customers' understanding of task structure and logical flow with consistency and compliance of task structure across channels. This can be done by ensuring that the design

is intuitive and easy to understand, allowing customers to easily see the structure of the task and understand how it should be completed.

DP10 – Uniformity

The design provides a consistent interface or similar object manipulation, so the customers experience the same features across channels.

The design principle of uniformity focuses on consistently providing the same type of interface or similar object manipulation, so the customer experiences the same features across channels. This means the design should use consistent visual and interactive elements throughout the customer experience, regardless of the channel used. The aim is to create a customer experience that is predictable and familiar, reducing the learning curve and making it easier for the customer to use different channels.

To incorporate the principle of uniformity into the design framework, the design should provide the same type of interface or similar object manipulation consistently so that the customer experience is the same across channels. This can be done by ensuring that the design elements, such as buttons or icons, are used consistently throughout the system, allowing customers to quickly understand how to use the system regardless of the channel used.

Table 5.4. Final Design Principles

DP#	Design Principle	Design Principle Specification	Flow Experience Dimensions
1	Interoperability	The design facilitates the portability of tasks between channels.	Continuity of the task
2	Correlation	The design prevents loss of progress or repetition of work done in another channel by correlation of data across interactions.	Continuity of the task
3	Place-making	The design supports the customers' orientation during the interaction when switching between channels.	Continuity of the task
4	Seamfulness	The design enables the presence of cues and reminders for points of departure to other channels/touchpoints clearly to avoid confusion.	Continuity of the task

5	Resilience	The design enables task flow between channels to align with the customer's view of the journey.	Constancy of emotional and cognitive fit
6	Actionability	The design aligns the sequence of steps with the customer's mental model to enable appropriate actions.	Constancy of emotional and cognitive fit
7	Reduction	The design facilitates the movement of tasks between channels with minimal overhead.	Constancy of emotional and cognitive fit
8	Navigability	The design provides customers with a clear understanding of how to move between channels.	Constancy of emotional and cognitive fit
9	Composition	The design supports the customer's understanding of task structure and logical flow through consistency and compliance of the task structure across channels.	Consistency
10	Uniformity	The design provides a consistent interface or similar object manipulation so the customer experiences the same aspects of features across channels.	Consistency

5.6. Summary

This chapter presents the omniflow framework and associated design principles. The design framework provides the structure for the design process while the principles provide the guidelines for how the design should function. We posit that by utilizing both the design framework and the design principles, retailers can design technology-enabled interactions effectively. This approach will produce an enhanced customer flow experience in an omnichannel retail setting.

Chapter 6

Demonstration and Evaluation

This chapter describes the demonstration and evaluation of the omniflow framework in supporting the design of interactions for a smooth flow experience. It is structured as follows: Section 6.1 explains the overall methodology for the evaluation, including the criteria that were developed for assessment. Section 6.2 provides examples of how the omniflow framework was used in real-world contexts using an in-depth case study. Section 6.3 presents the results of the evaluation. Finally, Section 6.4 provides a summary of the chapter.

6.1. Evaluation Overview

A detailed evaluation process was conducted to assess the framework's completeness, usefulness, and effectiveness in meeting the subjective needs of users within the retail context. This evaluation was conducted as part of the Design Science Research Methodology roadmap, as outlined in Section 3.3 and depicted in Figure 3.1. The case study of an Irish retailer (presented in Section 3.4) was used as the setting for the evaluation.

Over the course of a three-plus-year engagement with the retail company, regular meetings, co-design workshops, semi-structured interviews, and focus groups were held with retail experts to gather data on the omniflow framework and its components. The data collected was used to develop models that were then presented to retail executives and managers for feedback. This feedback was used to improve the design, and further insights were gathered through additional semi-structured interviews and focus groups with the managers after they had used the framework in three different settings for designing new interactions and services. The details of the data collection and analysis are presented in Section 3.4.4.

The evaluation of the omniflow framework was conducted along two dimensions, semantic and pragmatic, as shown in Table 6.1. The semantic evaluation was part of the ex-ante evaluation, which evaluates the artefact before its implementation, while the pragmatic

evaluation was part of the ex-post evaluation, which assesses the utility of the artefact after its implementation (Venable et al., 2012).

Table 6.2 shows the evaluation criteria used for the evaluation, which included the assessment of completeness, usefulness and applicability, and effectiveness. These criteria were chosen because they provide a comprehensive evaluation of the omniflow framework, ensuring that its success in meeting the needs of users within a retail context is accurately assessed.

Table 6.1. Evaluation Criteria

Evaluation Dimension	**Quality Criteria**	**What to Evaluate**
Semantic	Completeness	Representation of all necessary elements
		Alignment between designs at various levels
Pragmatic	Applicability	Relevance of application of the design framework in retail design
	Usefulness	Usefulness of the design process to facilitate design for a better flow experience
	Effectiveness	Perceived effectiveness of the design process to improve flow experience

6.2. Demonstration of the Framework

Following the design science approach explained in Section 3.3, the omniflow framework was used to aid the design of three new services with different types of technologies involved. These were: i) a new virtual reality store connected with the e-commerce website; ii) an omnichannel loyalty programme; and iii) a remote sales assistant helping online customers while being in-store. The aim of these three retail services — a virtual reality store, an omnichannel loyalty program, and a remote sales assistant — was to create a smooth flow experience for customers. Working with the retail partner IR, the omniflow framework was tested in real-world retail service design projects. The three services provided ample opportunities for developing and validating the omniflow framework as the entire design process — from system design to assessment design — was implemented.

6.2.1. Virtual Reality Store

The omniflow framework was first implemented as part of a two-year project aimed at designing a new type of virtual interaction for IR. The company recognized the potential of virtual reality technology and wanted to explore how to integrate it with their existing e-commerce store and other touchpoints to enhance the flow experience. With virtual reality, retailers have the opportunity to provide customers with an immersive digital experience without sacrificing the benefits of physical stores. The metaverse allows retailers to combine physical and online worlds to create a seamless experience for customers, as well as enhance their marketing strategies. Many companies see virtual reality as a new way to engage with customers, and 72% of executives believe it will have a positive impact on their organizations.

The researcher was brought on board to assist with this endeavour and the utilization of the omniflow framework. The project aimed to make the new interaction seamless for customers by integrating different touchpoints and channels to create a cohesive and consistent flow experience. The company and the researcher worked closely together on this. The project brought together a multidisciplinary design team comprised of the research team and professionals with expertise in marketing, service design, interaction design, and software engineering. This combination provided an ideal environment for the development and evaluation of the omniflow framework. The team utilized the framework to design the virtual reality store and its integration with the e-commerce store and other channels. The researcher gathered feedback to further improve the design.

VR-commerce stores are characterized by a computer-simulated, interactive, and real-time three-dimensional shopping environment, offering opportunities for a more functional, interactive, realistic, and engaging experience for customers (Xue et al., 2020). Various forms of v-commerce exist that can be differentiated by their level of immersion (Shahrbanian et al., 2012). In non-immersive systems, the virtual environment is accessed via a computer monitor and controlled by a keyboard and mouse, leading to a lowered feeling of presence in the environment and lower realism, but also fewer requirements regarding hardware and software (Park et al., 2018). Conversely, immersive systems allow for a realistic environment with a high sense of presence (Jain & Werth, 2019). Virtual reality is accessed, for example, through a head-mounted display and controlled with, for instance,

data gloves, controllers, or body movements, leading to higher requirements for software and hardware (Park et al., 2018).

Visual design elements of a store can be divided into two dimensions, aesthetic factors, such as colour, texture, or patterns, that help customers to feel pleasure in a store, and functional factors, such as layout, comfort, or signage (Baker, 1986). The aesthetic factors have a strong influence on the visual complexity of a store, i.e., the amount of detail and variety of visual stimuli and information in a v-commerce store (Jang et al., 2018). This refers, for example, to general design elements, such as floors, walls, and furniture, as well as the diversity of products. Environments that are too complex can negatively affect customers' perceived attractiveness or approach intentions (Jang et al., 2018). Also, ambient factors, e.g., sounds, are important for the general customer experience (Hassouneh & Brengman, 2015). Similar to that of physical stores, the layout of a virtual store can have a strong influence on users' buying and interaction behaviour (Vrechopoulos et al., 2004). The three most common layouts are grid (i.e., parallel displays and long, rectangular aisles), freeform (i.e., asymmetrically arranged and non-identical displays), and racetrack (i.e., semi-separate, individual areas for each shopping theme), which address different types of shoppers and allow for different shopping experiences (Vrechopoulos et al., 2004).

Furthermore, v-commerce-specific design factors, such as the mode of navigation (i.e., flying or walking) (Hassouneh & Brengman, 2015) or assistant systems (Xue et al., 2020) should be considered. To attract customers and increase their trust in v-commerce, designing an authentic and pleasant environment is essential (Xue et al., 2020). Other elements facilitating the v-commerce customer journey are elements at the point of purchase, such as the type of product presentation and organization or the type of information provision (Hassouneh & Brengman, 2015).

6.2.1.1. System Design

The initial phase in the design of interactions at IR involved creating a system design using the omniflow design framework. As illustrated in Figure 6.1, IR system design is based on the system design process detailed in Section 5.2. This highlighted multiple retailer touchpoints originating from the retailer channel that customers encounter. These touchpoints are facilitated by various third-party technologies. In addition to these retailer

touchpoints, customers also encounter third-party touchpoints such as Google Maps, as well as other customer touchpoints like product reviews or social media posts.

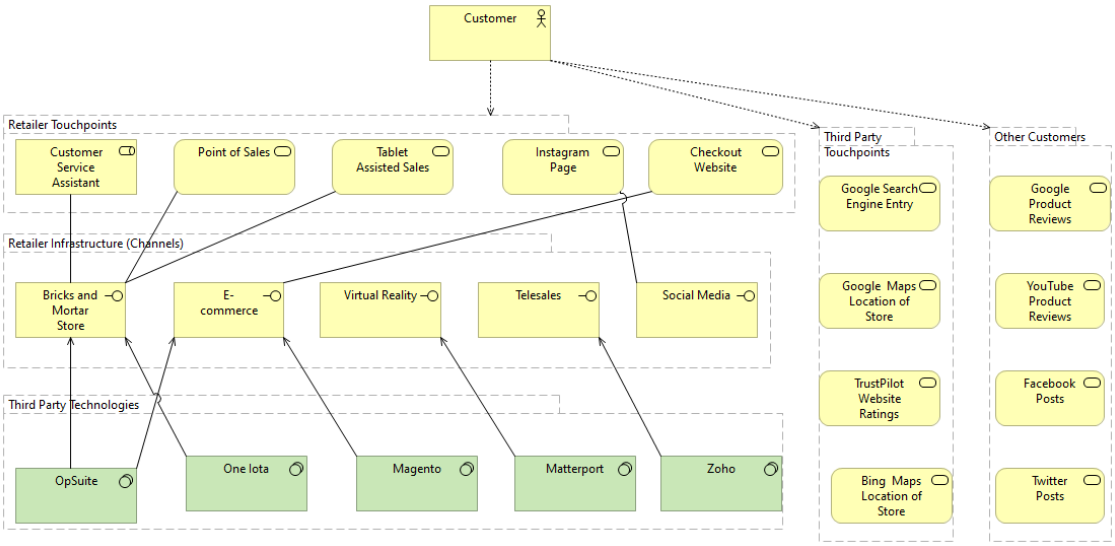


Figure 6.1 System Design for IR

6.2.1.2. Encounter Design

Encounter design was designed at IR for the VR store detailing the information requirements when a customer transitions from one touchpoint to the next utilizing the norm and information objects presented in Tables 6.1 and 6.2. Figure 6.2 depicts the connections between norm and information objects based on the activities performed in the customer journey involving the VR store.

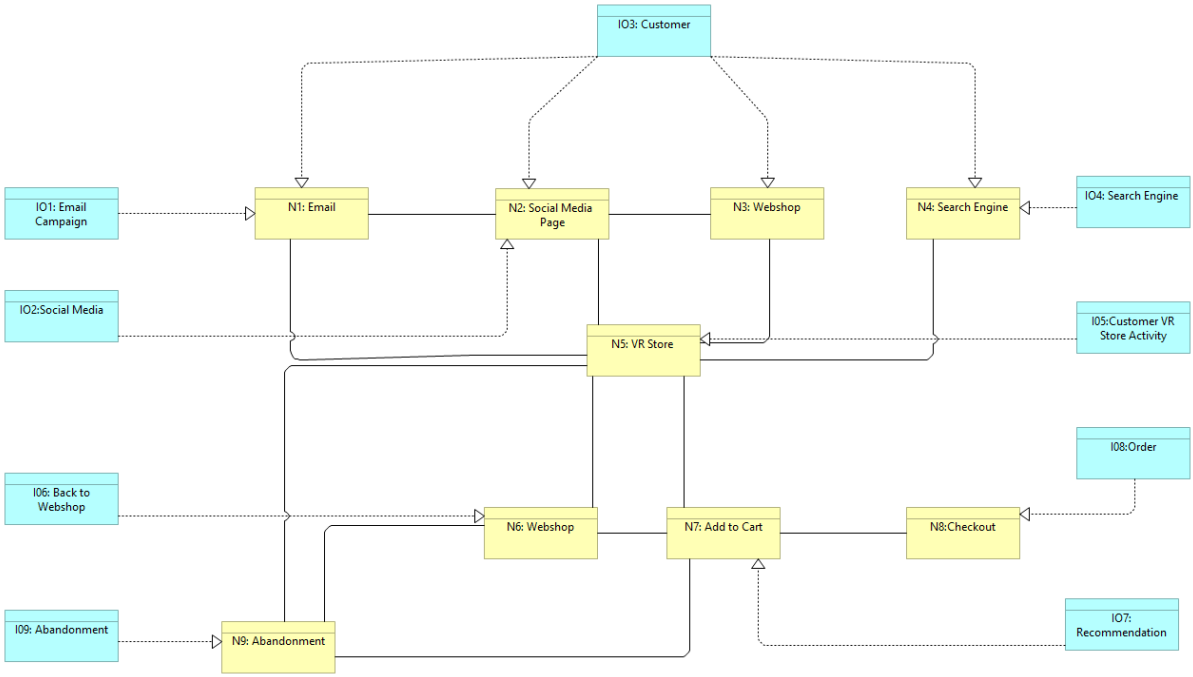


Figure 6.2. Encounter design for virtual store

Table 6.2 presents the information requirements specific to IR and utilizes terminology unique to this context. The key terms used in the table are defined below to facilitate readers' understanding.

A "source" represents the origin of traffic to a website or app, which may include search engines, referral websites, or specific marketing campaigns. For example, a source could be "Google" for organic search traffic, "Facebook" for traffic from the Facebook website, or "newsletter" for traffic from an email marketing campaign. A "medium" is a general category that describes the source. It refers to the broader category of the source, such as "organic" for traffic from search engines, "referral" for traffic from other websites, or "email" for traffic from email marketing campaigns. In this context, email is considered a medium; the specific source will be the email campaign name. For example, a source could be "newsletter January," and the medium could be "email". The “Product ID” is a unique identifier for the product, while the Product Name, Price, Quantity, and Attributes provide additional information about the product. The referral code can be used to track the source of the referral and for marketing purposes. The “Campaign ID” identifies the specific campaign that led the user to the website. The IP address can be used to determine the user's location, while the query string is used to pass additional data to the e-commerce website, such as the product being viewed or searched. Finally, the social media ID is used to identify the user

and their profile attributes on the social media platform, while the social media activity describes the type of engagement the customer had, such as a post, ad, story, or message.

Table 6.2. Attributes of Norm Objects

Code	Norm Object	Actor and Event
NO1	Email	a: Customer; e: Customer receives an email with a link to visit the e-commerce website's new virtual reality store
NO2	Social Media Page	a: Customer; e: Customer visits the e-commerce website's social media page and clicks on a link to visit the virtual reality store
NO3	Webshop	a: Customer; e: Customer visits the e-commerce website to browse and purchase products
NO4	Search Engine	a: Customer; e: Customer uses a search engine to find the e-commerce website's virtual reality store and its products
NO5	VR Store	a: Customer; e: Customer visits the e-commerce website's virtual reality store to view and purchase products in a virtual environment
NO6	Back to Webshop	a: Customer; e: Customer navigates back to the e-commerce website from the virtual reality store
NO7	Add to Cart	a: Customer; e: Customer adds a product to their shopping cart on the e-commerce website
NO8	Checkout	a: Customer; e: Customer proceeds to checkout and completes their purchase on the e-commerce website
NO9	Abandonment	a: Customer; e: Customer abandons their shopping cart and does not complete their purchase on the e-commerce website.

Table 6.3. Attributes of Information Objects

Code	Information Object	Meaning, Value, Location, and Representation
IO1	Email Campaign	m: Email address, Tracking ID, Medium, Source, Email campaign ID, Email recipient attributes, IP address, Referral code; v: "user@example.com", "xyz789", "email", "Campaign 1", "New Customer Welcome", {"Name": "John Smith", "Age": "35", "Gender": "male"}, "192.168.1.1", "ABC123" l: Email server, E-commerce website; r: As part of the URL query string, in the form of key-value pairs appended to the URL of the e-commerce website, also passed via email server API in the form of JSON object.

IO2	Social Media Page	m: Referral Code, Medium, Source, Social Media ID, Social Media activity, Query string; v: "ABC123", "Social Media", "Facebook", "12345", "post", "product=shoes&color=red&size=8" l: Social media platform, E-commerce website; r: As part of the URL query string, in the form of key-value pairs appended to the URL of the e-commerce website, also passed via social media platform API in the form of JSON object
IO3	Webshop	m: Referral code, Tracking ID, IP address, query string; v: "DEF456", "WEBSHOP123", "192.168.1.1", "product=shoes&color=red&size=8" l: E-commerce website; r: As part of the URL query string, in the form of key-value pairs appended to the URL of the e-commerce website
IO4	Search Engine	m: Medium, Source, Referral Code, Campaign ID, IP address, Query string; v: "Google", "DEF456", "SEARCH123", "192.168.1.1", "product=shoes&color=red&size=8" l: Search engine, E-commerce website; r: As part of the URL query string, in the form of key-value pairs appended to the URL of the e-commerce website, also passed via the search engine's API in the form of JSON object.
IO5	VR Store Activity	m: User ID, Product ID, Timestamp, User attributes (Age, Gender); v: "12345", "67890", "2022-01-01 12:00:00", “Male”, “35” l: VR Store, E-commerce website; r: Passed via API call from the VR Store to the E-commerce website, in the form of JSON object containing the user and product information, and timestamp of the interaction.
IO6	Back to Webshop	m: Referral code, Tracking ID, IP address, query string; v: "DEF456", "WEBSHOP123", "192.168.1.1", "product=shoes&color=red&size=8" l: VR Store, E-commerce website; r: As part of the URL query string, in the form of key-value pairs appended to the URL of the e-commerce website
IO7	Add to Cart	m: Product ID, Product Name, Product Price, Product Quantity, Product Attributes, Referral Code, Campaign ID; v: "12345", "Red Running Shoes", "$100", "1", "Size: 8, Color: Red, Brand: Nike" l: Products page, Shopping cart page;

		r: As part of the URL query string, in the form of key-value pairs appended to the URL of the shopping cart page, also passed via JavaScript variables to the shopping cart page.
IO8	Checkout	m: User Information, Payment Information, Shipping Information, Order Total, Order ID; v: {"Name": "John Smith", "Email": "user@example.com", "Phone": "555-555-5555", "Address": "123 Main St."}, {"Card Number": "XXXX-XXXX-XXXX-1234", "Expiration Date": "12/2022", "Security Code": "123"}, {"Name": "John Smith", "Address": "123 Main St.", "City": "Anytown", "State": "NY", "Zip": "12345"}, "$100", "ORDER123" l: Shopping cart page, Order confirmation page; r: Passed via a form submission and stored in the e-commerce website's database for order tracking and fulfilment
IO9	Abandonment	m: User ID, Timestamp, Order ID; v: "12345", "2022-01-01 12:00:00", "ORDER123" l: Shopping cart page, Checkout page; r: Passed via JavaScript variables, and stored in a cookie or local storage to track user behaviour and abandoned orders

6.2.1.3. Assessment Design

Assessment design was demonstrated by developing an interactive web dashboard combining data from various software applications being used by IR. The data was collected using API calls to the relevant endpoints to which we were provided access by IR. It was then hosted on an AWS server utilizing a DynamoDB database. To maintain customers' data privacy in accordance with GDPR regulations, personal information was only collected with explicit consent and without disrupting the customer journey. Figures 6.4, 6.5, and 6.6 depict the interactive dashboard that was deployed and is being used by IR. The company logo on the top left has been removed from these figures to maintain IR's anonymity.

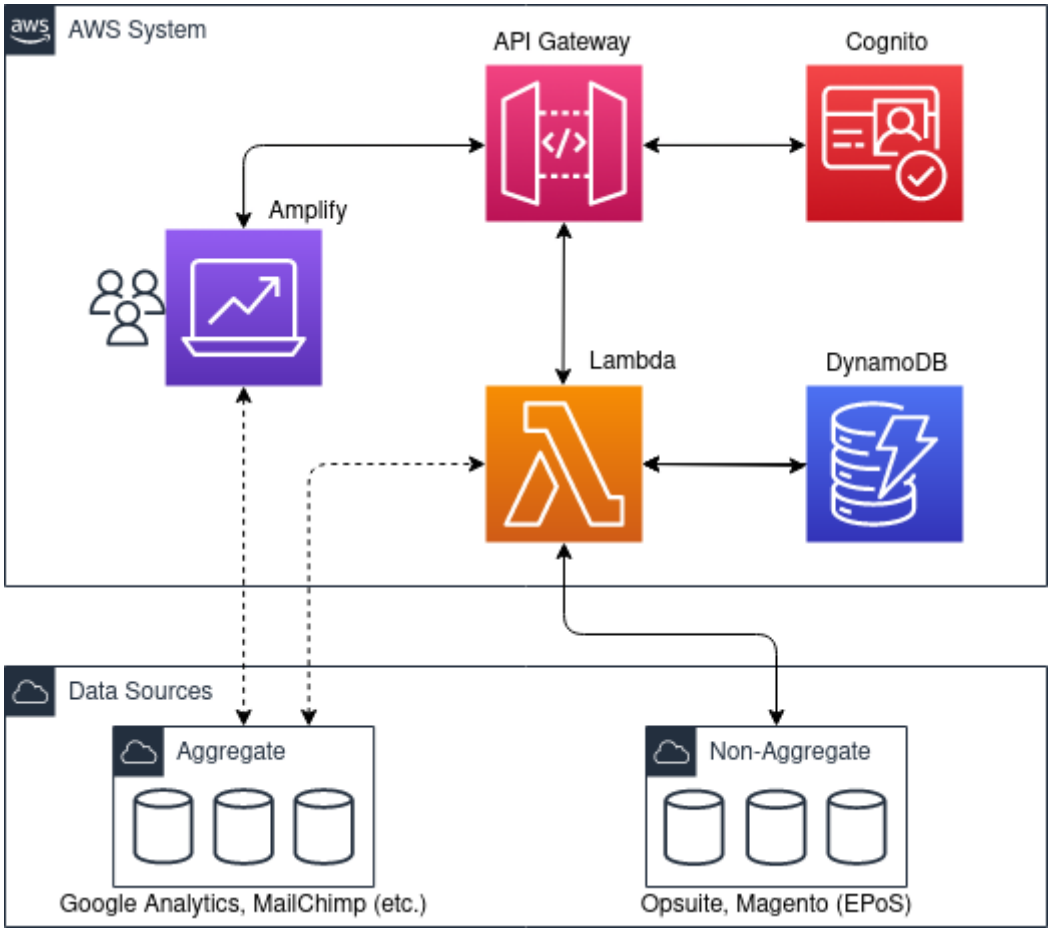


Figure 6.3. Architecture overview for IR dashboard development

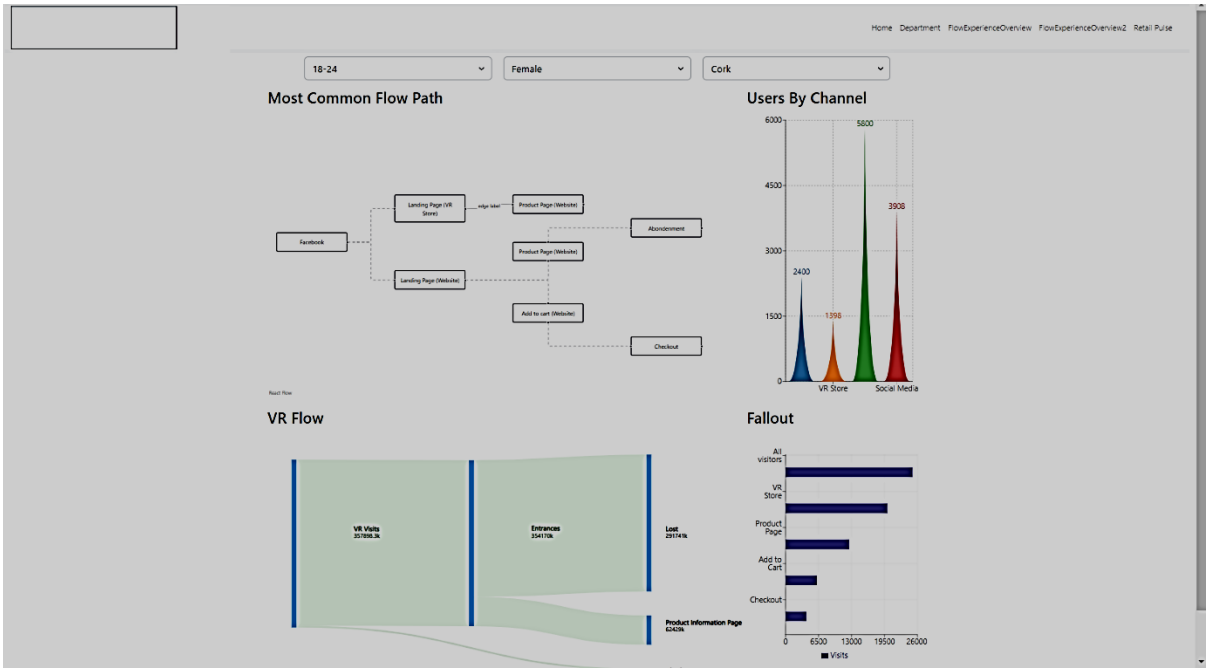


Figure 6.4 Snapshot of deployed dashboard (Page 1)

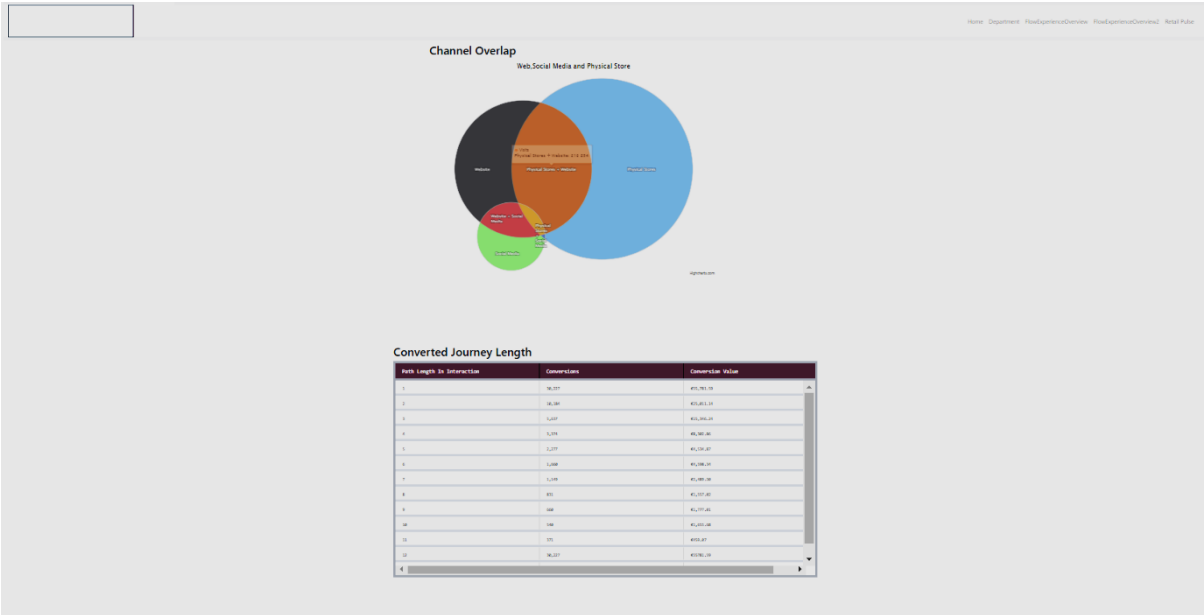


Figure 6.5. Snapshot of deployed dashboard (Page 2)

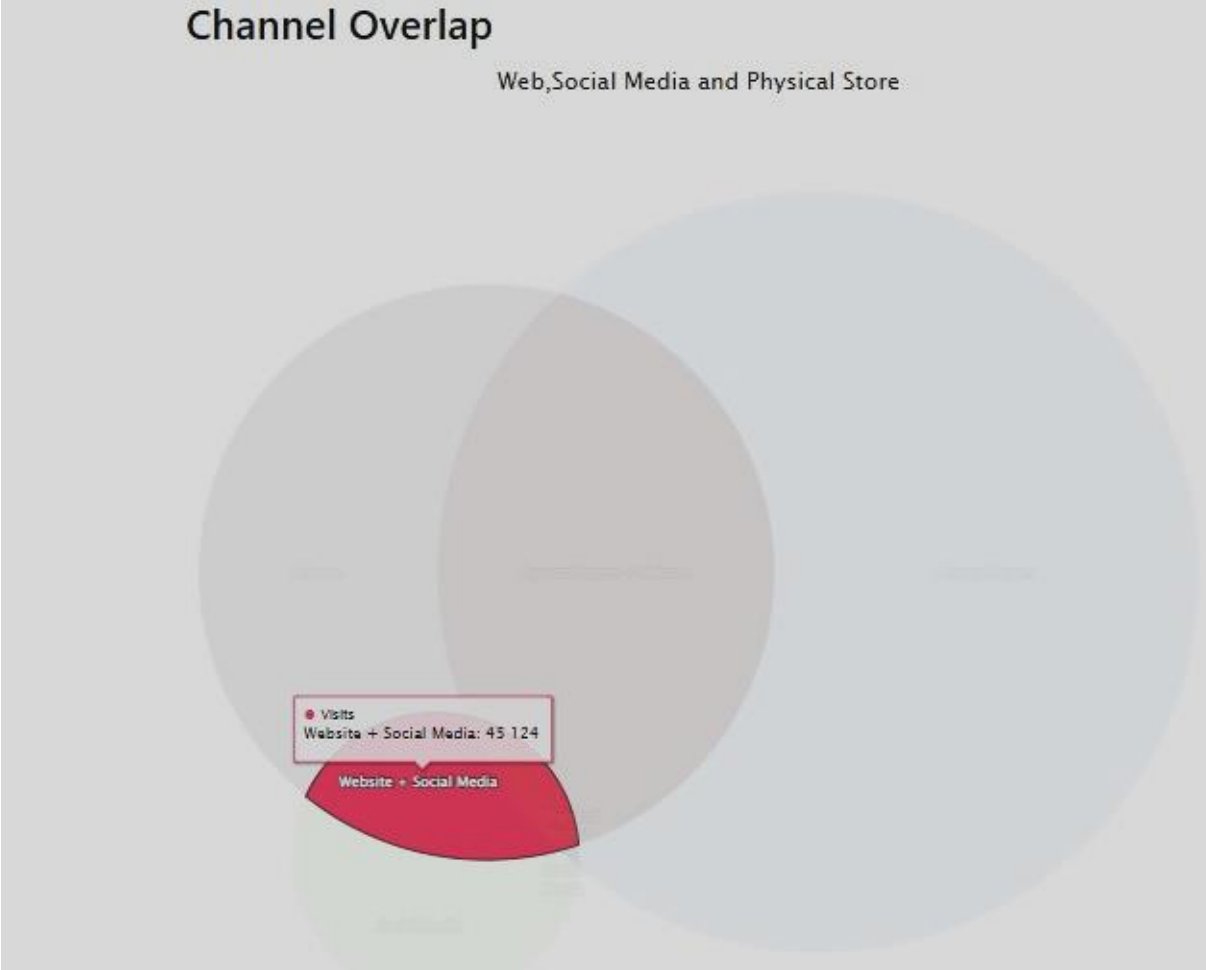


Figure 6.6. 2 Snapshot of the deployed dashboard (Page 3)

6.2.1.4. Outcome

The implementation of the VR store was successful as it resulted in a virtual reality store that was adequately integrated with the e-commerce store and other channels, providing a unique and engaging customer experience, as shown in Figures 6.7 and 6.8. The omniflow framework proved valuable for the team as it helped streamline the design process and ensure that the final product met the customers' needs. The project highlighted how the omniflow framework can be used to design and develop new technology-enabled services that improve customer experience. Across all the channels, the design team identified the initiatives listed in Table 6.4 to enhance the flow experience.

Table 6.4. Initiatives for improving flow experience.

Physical Store	**Mobile App**	**Social Media**	**Website**	**Virtual Store**
Presence of website product reviews	Information about product inventory available at physical stores	Link to website/ Shopping button/Shopping option	Access to Social Media Channels	Shopping button/Shopping option
Presence of QR codes for more information	Shop(s) location	Information about product inventory available at physical stores	Information about product inventory available at physical stores	Access to Social Media Channels
Information to access Social Media Channels	Return products bought online at physical stores	Shop location	Shop location	Information about product inventory

Figure 6.7. Snapshot of live virtual store

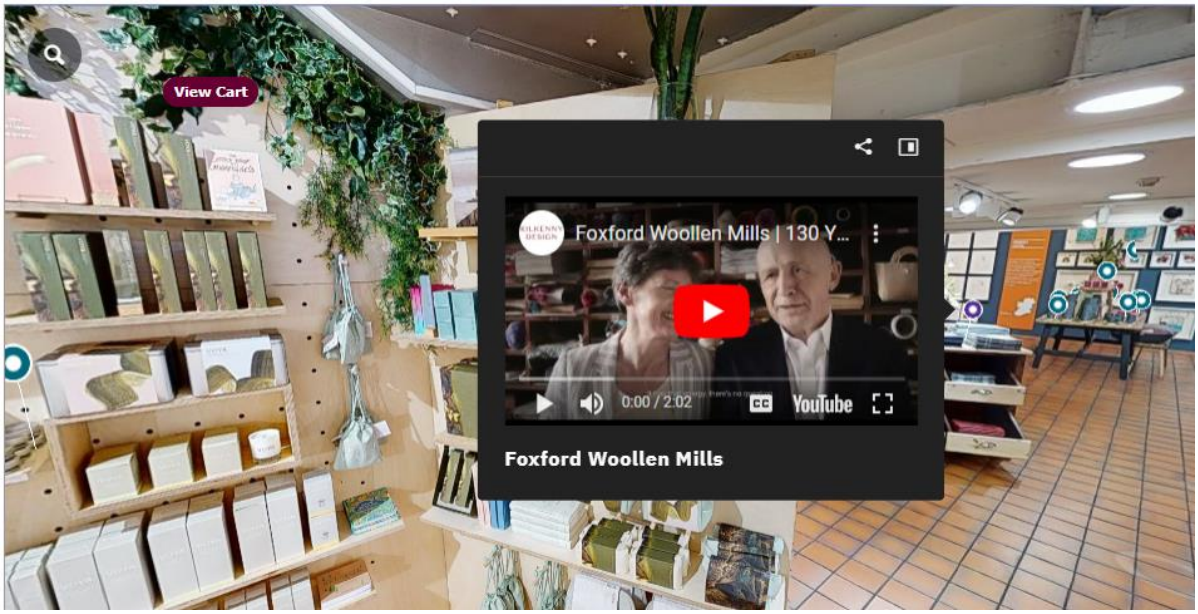


Figure 6.8. Snapshot of live virtual store with add-ons

6.2.2. Remote Sales Assistant

The omniflow framework was then used for the design of a remote sales assistant (RSA) service embedded in a virtual reality environment. The design was completed; however, IR did not implement the service. The details of RSA and its design are detailed below.

RSA is a human being who is located in a physical store but can provide prompt assistance to customers anywhere around the world. IR wanted to employ remote sales assistants to aid customers at any point in their purchasing process, from pre-purchase to finalizing their purchase. This can be done using virtual reality technology embedded in the retailer's website. The RSA service can also be integrated with the company's existing e-commerce platform, making it easy for customers to purchase products directly while using the service.

RSA represents an effective way to build a bridge between online and offline shopping experiences (Parise et al., 2016). By combining technologies and the personal touch, RSA service provides customers with a great shopping experience while retaining the benefits of personal interaction, which helps establish personal relationships and increase customer loyalty (Chi et al., 2016).

Using 3D virtual environments, remote sales assistants can appear on a user-owned mobile device or desktop in a virtual store, which mimics an in-person shopping experience. Additionally, the use of live video chat can enhance the customer experience by providing a higher level of immersion. Features such as co-browsing, screen sharing, and content sharing offer a level of interactivity previously unavailable.

Figure 6.9. A conceptualisation of remote sales assistant service

One example journey could be a customer browsing through a virtual reality store, but unsure of which product to choose. Customers can then initiate a VR tour with a remote sales assistant, who can answer product inquiries, explain different options, and make product-specific recommendations while showing the customer different products across the VR store. This type of personalization and engagement can lead to higher sales conversion rates and customer satisfaction. Another example journey could be a customer already knowing which product they want to purchase but needing assistance with the checkout process. A remote sales assistant can assist the customer in navigating the virtual reality store to find the desired product and guide them through the checkout process.

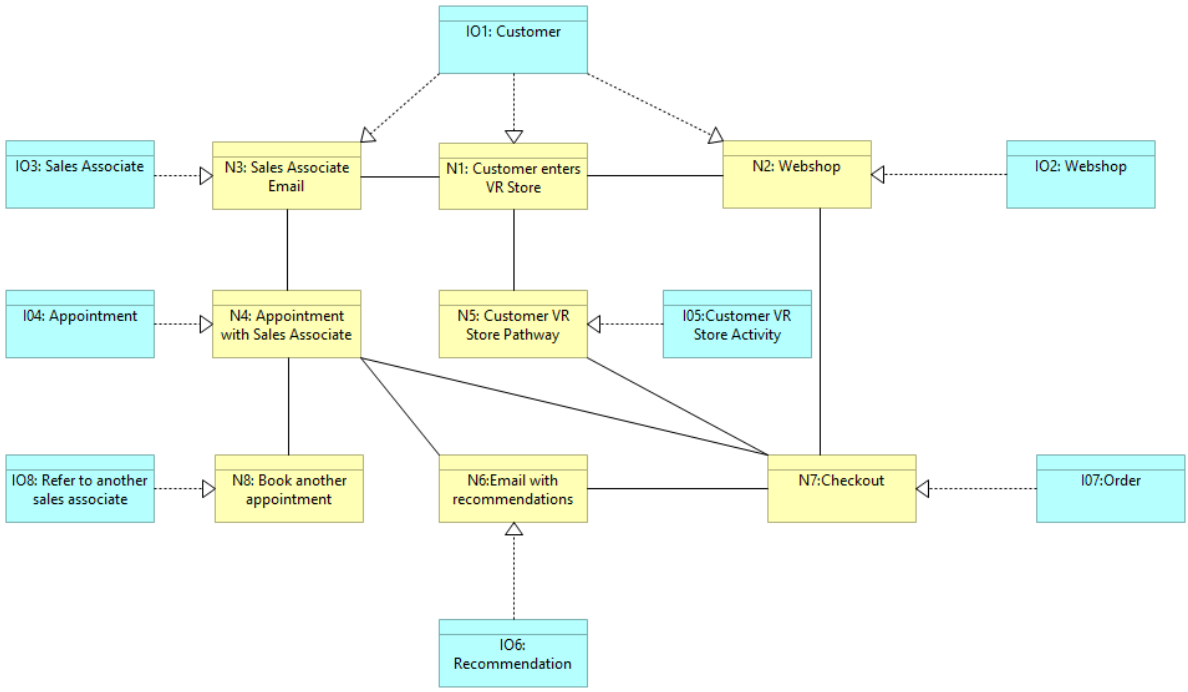


Figure 6.10. Encounter design for remote sales assistant service

The customer for the remote sales assistant journey interacts with a virtual sales assistant to purchase a product remotely. However, the journey involves several steps, each of which involves the exchange of different types of information. The steps and the information exchanged in each step are as follows.

Table 6.5. Attributes of Information Objects

Code	Information Object	Meaning(m), Value(v), Location(l) and Representation(r)
IO1	Customer	m: Customer ID, Name, Email, Address, Purchase History; v: "12345", "John Doe", "johndoe@email.com", "123 Main St", "555-555-5555", "History of past purchases" l: Customer database, Point-of-sale system; r: Customer information is collected and stored in the customer database during the registration process, and is passed through an API call to the point-of-sale system.
IO2	Webshop	m: Product ID, Name, Description, Price, Image; v: "67890", "Product A", "This is a description of Product A", "$100", "www.example.com/product-a.jpg" l: E-commerce website; r: Product information is collected and stored in the e-commerce website's database, and is displayed to the customer when they search for a product.
IO3	Sales Associate	m: Customer ID, Barcode; v: "12345", "987654321"

		l: Customer's mobile device; r: The customer saves the barcode to their mobile device's wallet app, which can be scanned at the point-of-sale system to update the customer's loyalty points and purchase history in real-time.
IO4	Appointment	m: Customer ID, Loyalty Points, Purchase Amount, Product ID, Timestamp; v: "12345", "50", "$200", "67890", "2022-12-01 12:00:00" l: Point-of-sale system, Loyalty program database; r: Data is passed through an API call from the point-of-sale system to the loyalty program database and updates the customer's loyalty points and purchase history in real-time.
IO5	VR Store Activity	m: Customer ID, Order ID, Product ID, Quantity, Total Price, Timestamp; v: "12345", "54321", "67890", "2", "$100", "2022-12-02 14:00:00" l: E-commerce website, Loyalty program database; r: Data is passed through an API call from the e-commerce website to the loyalty program database and updates the customer's loyalty points and purchase history in real-time.
IO6	Recommendation	m: Customer ID, Session ID, Timestamp; v: "12345", "abcdefg", "2022-12-03 09:00:00" l: E-commerce website; r: Data is collected and stored in the e-commerce website's database, indicating that the customer abandoned their shopping cart and did not complete the purchase.
IO7	Order	m: Order ID, Customer ID, Product ID, Quantity, Total Price, Timestamp; v: "54321", "12345", "67890", "2", "$100", "2022-12-04 16:00:00" l: Point-of-sale system, E-commerce website, Inventory system; r: Data is passed through an API call from the point-of-sale system to the e-commerce website's database and inventory system
IO8	Referral to another sales associate	m: Referral ID, Referrer ID, Referee ID, Timestamp; v: "123", "456", "789", "2022-12-05 10:00:00" l: Referral tracking system; r: Data is entered into the referral tracking system indicating that an employee with Referrer ID referred a customer with Referee ID at the specified time.

6.2.3. Loyalty Program

An Omni-Channel Loyalty Program was developed by IR with the primary objectives of increasing customer retention and average spend using the omniflow design framework. The loyalty program gathers detailed information about customers, such as their name, date of birth, location, address, interests, communication preferences, and phone number, at the initial sign-up stage. The email address is used as the single identifier for customers, and it is also the unique ID used in the backend to differentiate between different customers and their membership status. Once a member has signed up and is logged in, they can make use of discounted prices on items, and they will receive a gift/discount code on their birthday as an added incentive. Moreover, benefits/partnerships may be available in the future, which customers can avail of.

The loyalty program was designed to provide a personalised experience throughout the customer journey. The encounter design shown in Figure 6.11 shows the customer activities and associated information requirements. The customer signs up for the program on the website, and their form details are sent to OpSuite and stored. The customer then receives a barcode via email, which they can save to their wallet and use in-store to take advantage of special discounts at the checkout level. The design team for the loyalty programme identified the initiatives for the loyalty customer listed in Table 6.8 to enhance their flow experience.

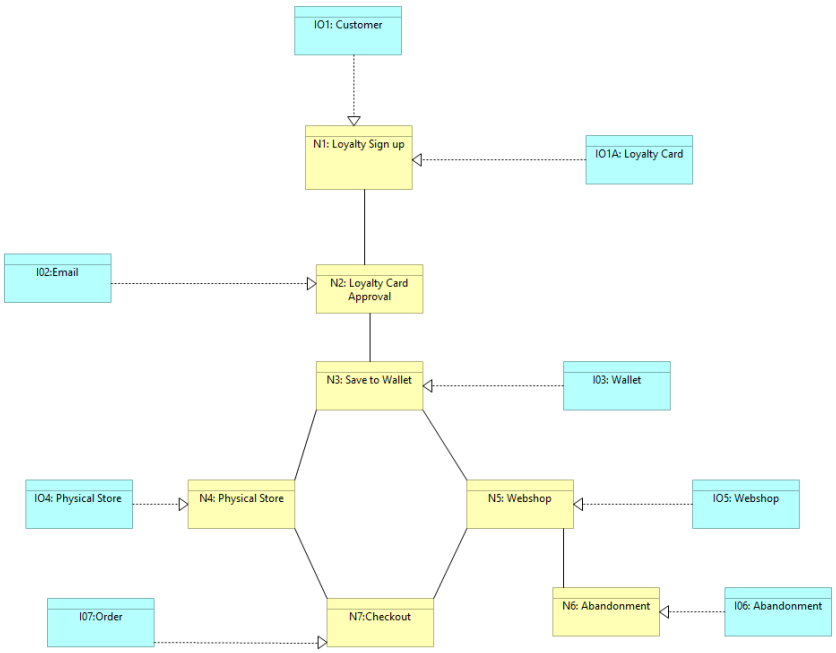


Figure 6.11. Encounter design for loyalty programme

Table 6.6. Attributes of Information Objects

Code	Information Object	Meaning, Value, Location, and Representation
IO1	Customer	m: Customer ID, Name, Email, Address, Phone Number, Loyalty Points, Purchase History; v: "12345", "John Doe", "johndoe@email.com", "123 Main St", "555-555-5555", "50", "History of past purchases" l: Customer database, Loyalty program database, Point-of-sale system; r: Customer information is collected and stored in the customer database during the registration process and is passed through an API call to the loyalty program database and updates the customer's loyalty points and purchase history in real-time.
IO1A	Loyalty Card	m: Customer ID, Barcode, Expiration Date; v: "12345", "987654321", "2025-12-31" l: Loyalty program database, Point-of-sale system; r: The barcode is generated and linked to the customer's account in the loyalty program database and is scanned at the point-of-sale system to update the customer's loyalty points and purchase history in real-time
IO2	Email	m: Customer ID, Email Address, Confirmation Link; v: "12345", "johndoe@email.com", "www.loyaltyprogram.com/confirm/12345" l: Email server, Loyalty program database; r: An email is sent to the customer's email address with a confirmation link, which, when clicked, confirms the customer's registration in the loyalty program and updates the customer's account status in the loyalty program database.
IO3	Wallet	m: Customer ID, Barcode; v: "12345", "987654321" l: Customer's mobile device; r: The customer saves the barcode to their mobile device's wallet app, which can be scanned at the point-of-sale system to update the customer's loyalty points and purchase history in real-time.
IO4	Physical Store	m: Customer ID, Loyalty Points, Purchase Amount, Product ID, Timestamp; v: "12345", "50", "$200", "67890", "2022-12-01 12:00:00" l: Point-of-sale system, Loyalty program database; r: Data is passed through an API call from the point-of-sale system to the loyalty program database and updates the customer's loyalty points and purchase history in real-time.
IO5	Webshop	m: Customer ID, Order ID, Product ID, Quantity, Total Price, Timestamp;

		v: "12345", "54321", "67890", "2", "$100", "2022-12-02 14:00:00" l: E-commerce website, Loyalty program database; r: Data is passed through an API call from the e-commerce website to the loyalty program database and updates the customer's loyalty points and purchase history in real-time.
IO6	Abandonment	m: Customer ID, Session ID, Timestamp; v: "12345", "abcdefg", "2022-12-03 09:00:00" l: E-commerce website; r: Data is collected and stored in the e-commerce website's database, indicating that the customer abandoned their shopping cart and did not complete the purchase.
IO7	Order	Order: m: Order ID, Customer ID, Product ID, Quantity, Total Price, Timestamp; v: "54321", "12345", "67890", "2", "$100",

Table 6.7. Attributes of Norm Objects

Code	Norm Object	Actor and Event
NO1	Customer Sign up	a: Customer; e: Customer signs up for an account on the e-commerce website
NO2	Loyalty Card Approval	a: Customer; e: Customer applies for a loyalty card on the e-commerce website and receives an email with approval
NO3	Save to Wallet	a: Customer; e: Customer saves a payment method to their digital wallet on their phone
NO4	Physical Store	a: Customer; e: Customer visits a physical store location
NO5	Webshop	a: Customer; e: Customer visits the e-commerce website
NO6	Abandonment	a: Customer; e: Customer adds products to their shopping cart but leaves the website without completing their purchase
NO7	Checkout	a: Customer; e: Customer enters their payment and shipping information and completes their purchase on the e-commerce website

Figure 6.12. Loyalty programme launch screen

Table 6.8. Initiatives for improving flow experience for loyalty programme customers

Physical Store	**Mobile App**	**Social Media**	**Website**	**Virtual Store**
Usage of Online Loyalty cards	Access to Shopping History	Recommendation of In-store events	Recommendation of In-store events	Geo-linking to the nearest store tour
Presence of Virtual Loyalty Card Reader	Location-based notifications		Past in-store and online purchases	
Presence of Mobile check out				

6.3. Evaluation Results

6.3.1. Evaluation – Suggestions

During the process of developing the omniflow framework, insights from industry practitioners were actively sought and incorporated. The suggestions and feedback from these experts played a crucial role in refining and improving the framework. This collaboration helped to ensure that the framework was grounded in practical considerations and responsive to the real-world needs of businesses.

The results of the interviews with the practitioners are presented in Table 6.9, which outlines their practical suggestions and the modifications made to the framework based on their input. These modifications are in line with the goal of creating a framework that is not only theoretically robust but also practical and applicable to real-world business contexts. They pointed out the importance of recognizing the interpersonal aspect of certain touchpoints and the need to divide touchpoints into three categories: interpersonal, hybrid, and informational/brand visibility. By categorizing touchpoints in this manner, the framework provides a clear structure for the system design process, allowing users to allocate touchpoints into their respective categories.

One of the major improvements made to the system design was the addition of more detail, allowing users to build a database of information that needs to be attributed to each area. Although an automated interface was not within the scope of the current project, it was noted as a possibility for future research and development as it would streamline the process and improve the efficiency and comprehensiveness of the information exchange.

The practitioners also suggested simplifying the encounter design to make it easier for users to understand, especially as it can look quite complex, with many different branches and scenarios. To address this concern, the encounter design was simplified to present a broad concept first; then, users can add the necessary details. The information exchange in the encounter design process now caters to the different ways customers interact with social media touchpoints, such as through posts, ads, stories, or messages.

Finally, the assessment design was made customizable to match the specific metrics of each company. In the context of IR, the metrics, such as the most used flow paths, were added to ensure that all relevant information was captured. The customizable aspect of the assessment

design allows companies to adapt it to their own needs and objectives, ensuring that the framework is suitable for a range of retail environments.

Table 6.9. Practitioner feedback and modifications

Focus Area	Transcriptions	Action Taken
Overall Framework	In respect of people coming to the store, the relationship building is far more important. And there is an interpersonal aspect to it. The framework should recognize the interpersonal aspect of some touchpoints.	Based on the suggestions, we have divided the touchpoints into three categories (interpersonal, hybrid and informational/brand visibility). We also explained to the practitioners that during the system design part they can allocated touchpoints into these categories.
	For some touchpoints, you can see specifically where it's coming from, but then you have the unknown touch points where they never come near your site, but they see your brand. And maybe it's breaking it into those two and then how they flow along into each of the channels.	The unknown touchpoints are covered by brand visibility touchpoints as there are no direct interaction.
System Design	So having the details at the very beginning it's where the biggest addition I would say or the biggest flag for me. the more detailed you can be the better so literally building databases of exactly what needs to be say attributed to each area.	We have added more detail to the system design that allows the user to build a database of information that needs to be attributed to each area.
	Some sort of automated interface that. They could put the information in, and the output is then you know put out but yeah they would. They would find it handy, but you'd need to take it a couple of more steps up.	This was out of the scope for this project but for future research/development we are considering adding an automated interface for inputting information. Introduce an automated interface to streamline the process and make sure that all relevant information is

		attributed to each area, making the process more efficient and comprehensive.
Encounter Design	what we need on the left-hand side is all of the touch points and literally listed on the left and then the journey going along the right just to make it easy for them to understand. encounter designs looks quite complex to me. Yeah. Yeah. Again, it looks just too complex. I know. You think of at all when you've got so many branches in so many scenarios, it's gonna look complex	We have simplified the encounter design to make it easier to understand as a broad concept first before the users add any details.
	So, for example, looking at say, the Instagram page. Yep. So, where the customer would actually touch the Instagram page. So will it be a post, will it be an ad would it be a story would it be a friend sending a message all different areas and how they're actually linking into it and covering up every area to that's part of it.	The information exchange in the encounter design process caters for the different ways customers interact with the touchpoints (e.g. post, ad, story, message)
Assessment Design	In terms of assessments as well. Like a lot of assessments won't be a blanket one. It'll be different. Every company every company has their own set of KPIs and master own set of what's important to them. So I was trying to map that over to that it's not blanket but there's a few crucial ones that everyone should be looking at from retail.	We have developed a customizable assessment design that can be adapted by each company to match their specific KPIs and make sure that the crucial ones are being monitored. Additionally, consider the possible outcomes that may arise from each assessment path.
	In respect of path to follow that if you follow a path, there's going to be a couple of possibilities that could come from that path.	We have added the most used flow path for each relevant channel in the assessment design.

6.3.2. Evaluation – Completeness

Table 6.10 presents the results of an evaluation of the completeness of the omniflow framework, which is designed to help retailers design interactions to provide a better flow experience across multiple channels. The evaluation covers four focus areas: the overall framework, system design, encounter design, and assessment design.

The overall framework is evaluated as comprehensive, bringing together all the essential elements for designing customer interactions. The system design is seen as comprehensive incorporating physical and digital aspects of customer interactions and coherently integrating various technologies and channels.

The encounter design is seen as considering all relevant factors to ensure a consistent and personalized experience for customers throughout their journey. The assessment design is evaluated as comprehensive and effective, providing a mechanism to measure and evaluate the performance of the design and its impact on the flow experience.

In conclusion, the omniflow framework is evaluated as complete in all four focus areas, providing a comprehensive solution for retailers.

Table 6.10. Feedback on Completeness

Focus Area	Feedback from Practitioners
Overall Framework	"I think it kind of brings a lot of it together" (Brand & Commercial Director)
System Design	"I think you've got everything pretty much signed after with the physical side and the digital side that you're looking at websites, mobile app, IoT" (IT Manager)
	"The system design allows integration of all the relevant technologies and channels in a coherent manner." (Technical Lead)
Encounter Design	"The encounter design allows us to take into account all the relevant factors for connecting the different parts of the customer journey." "The encounter design ensures a consistent and seamless experience for customers, no matter the touchpoint." (Customer Service Manager)
Assessment Design	"I don't see anything additional needed there" (Technology Consultant)

6.3.3. Evaluation – Usefulness

This section presents the feedback received from practitioners regarding the usefulness and applicability of the framework used in the design of customer interactions. The feedback shown in Table 6.11 is split into various focus areas of the framework, including the overall framework, system design, encounter design, and assessment design. The feedback in the table highlights the usefulness and applicability of the framework as described by practitioners from different departments such as marketing, e-commerce, IT, and strategy.

The practitioners describe the framework as reducing the level of risk by providing a clear understanding of how each area is protected and the consistency of customer experience. A strategy director acknowledges that the flow diagram of the framework "mitigates the level of risk because you know how much you've protected each of the different areas or how consistent it's gonna be." The CEO stated, "It's more valuable when you're doing a one-off analysis."

For the system design, the strategy director appreciates the framework's usefulness in identifying where customer interactions are taking place. They also describe the framework as allowing for the alignment of various customer touchpoints and providing a thorough understanding of the customer journey.

The encounter design usefulness is highlighted through the improvements in information exchange and real-time data gathering. The marketing manager stated, "You can put together every touchpoint mapped out with the customer in the middle, and you could literally have 1000 touchpoints." The assessment design is considered valuable for analysing interactions and understanding design issues.

Overall, the feedback in the table highlights the usefulness and applicability of the framework in designing customer interactions and improving the customer experience. Practitioners from different departments express their appreciation for the framework's ability to mitigate risk and provide a clear understanding of customer interactions.

Table 6.11. Feedback on Usefulness and Applicability

Focus Area	Feedback from Practitioners
Overall Framework	"This framework enables the alignment of an extensive number of customer touchpoints, providing a thorough understanding of the customer journey." - (Marketing Manager)
	"It is more valuable for me when I am doing a one off analysis." (CEO)

	“the ability to react well to that and react quickly to what's happening to speed as well and a lot of different systems linking together can be challenging, with development and speed and all that but having the framework sped that up very fast.” (Marketing Manager)
	“It helped me in finding out that there are things which are not consistent.” (Strategy Director)
System Design	“it's back to that system design diagram. If that's been done very well, that mitigates level of the risk because you know how much you've protected each of the different areas or how consistent it's gonna be.” (Strategy Director)
	"It's important to begin by identifying where the interactions are taking place with the system design before moving on to each encounter and assessment." - (Marketing Manager)
	“it's extremely useful for me in terms of at least you know that you're starting off and you can take confidence, I suppose, and be reassured that every touch point is covered and every interaction is covered and every area is covered.” (Head of E-commerce)
Encounter Design	"This tool is extremely valuable to me as it enables me to identify where we stand in terms of information passing from one touchpoint to another and ensure that all necessary information is covered. This provides me with the assurance to move forward." (Data Analyst)
	“Using this you can put together , every touchpoint mapped out full 360 with customer in the middle, and you could literally have 1000 touch points. That's great, it's endless. It's brilliant. But I love the kind of the way it's going through because you're staring at a very beginning and saying right, where am I actually Where's where's the interaction happening? Then moving through each the encounters and the assessment. It's the for me it makes complete sense to move through it. Sorting is very straightforward to me.” (Marketing Manager)
	"It's a lot easier to understand the information being exchanged when it's clearly represented, like using unique IDs and common data formats. This makes the information more accurate and easier to understand. (Analyst)
Assessment Design	"The detailed evaluation has helped in understanding of the design issues and how we can improve them." (Technical Lead)
	"I think this will help and I think explanation of this will help as well." (Head of IT)

6.3.4. Evaluation – Effectiveness

The omniflow framework has led to an improvement in the customer experience, as seen in the increased number of repeat customers, according to the Head of Marketing. This can be attributed to the comprehensive approach taken with the overall framework, system design, encounter design, and assessment design. The system design allowed for streamlined

processes and efficient resource allocation, including third-party touchpoints, as noted by the Head of Operations. The encounter design has improved the use of APIs and real-time data gathering, enabling quick changes in response to customer needs, as stated by the Head of E-commerce. Additionally, the use of unique IDs and common data formats has made information exchange easier to understand, improving accuracy, as noted by the Head of IT. The assessment design, using dashboards, has provided a clear picture of the customer journey flow, enabling informed decisions for future enhancements, according to the Head of Customer Service.

Table 6.12. Feedback on Effectiveness

Focus Area	Feedback from Practitioners
Overall Framework	"We have seen a spike in repeat customers, which I believe is a direct result of the improvements we've made to our flow experience using this framework." (Head of Marketing)
System Design	"The system design allowed us to streamline processes and make efficient use of resources, particularly allocating resources for third party touchpoints." - (Head of Operations)
Encounter Design	"The use of the encounter design in this way has allowed us to improve our use of APIs and real-time data gathering to quickly make changes in response to customer needs and preferences in a way that was not possible before." - (Head of E-commerce)
	"It's a lot easier to understand the information being exchanged when it's clearly represented, like using unique IDs and common data formats. This makes the information more accurate and easier to understand." - (Head of IT)
Assessment Design	"The regular use of dashboard based on the assessment design gave us a clear picture of flow in our customer journey, which we can then use to make decisions for future enhancements." - (Head of Customer Service)

6.4. Demonstration and Evaluation Summary

The chapter demonstrated and evaluated the omniflow framework. It provided a comprehensive overview of its application in three different retail scenarios. The evaluation results confirmed the completeness, usefulness, and effectiveness of the omniflow framework in designing interactions that enhance the flow experience of the omnichannel customer journey.

Chapter 7

Discussion and Conclusion

This chapter revisits the research questions that guided this research study, summarises the findings of this research and presents the main theoretical and managerial contributions of this research. Furthermore, we discuss the limitation of this study and offer recommendations for future research in this area. The chapter culminates with final remarks.

7.1. Revisiting the Research Questions

In Section 1.3, the research questions are presented, which were formulated to tackle the challenges related to the design of technology-enabled interactions to enhance the flow experience in an omnichannel customer journey. This section will now review and discuss these research questions, as well as present their main findings. Figure 7.1 shows the main outputs of this research developed to answer these research questions.

7.1.1. RQ1 – What are the main dimensions of flow experience in an omnichannel retail setting?

Three main dimensions of flow experience are identified in this study that capture customers' assessments of flow experience: continuity, consistency and emotional and cognitive fit. These dimensions are defined based on the literature review. Section 2.1.3 describes these main dimensions in detail, and these are summarised in Section 7.2.1.

7.1.2. RQ2- What are the most effective technologies that enable channel integration and enhance the flow experience in an omnichannel retail setting?

This study identified the technologies and digital solutions that act as enablers for channel integration activities. Section 4.4 describes the effective technologies that enable the channel integration activities identified in Section 3.3. We also underlined examples of retail companies that have already attempted to integrate the channels and enhance the flow experience using the identified technologies.

7.1.3. RQ3 – How can omnichannel retail interactions be designed and evaluated?

The main objective of the research was to develop and evaluate the artefact for the design of technology-enabled interactions in omnichannel retail. To answer this research question, we developed a design framework, demonstrated how the proposed framework was used in real-world settings and provided guidelines for implementation using design principles. Based on the results from the demonstration and feedback from practitioners, the framework was improved. Chapter 5 details the design, and Chapter 6 details the demonstration and evaluation of the "omniflow framework".

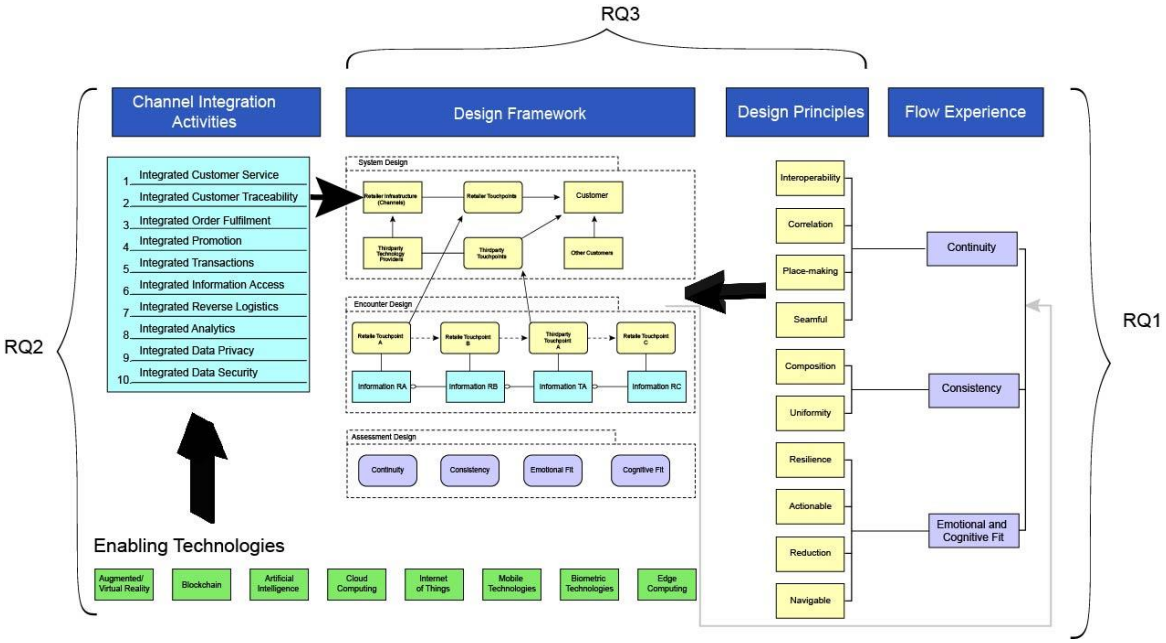


Figure 7.1 Research Output Summary

7.2. Summary of the Findings

This section will present and discuss the main findings of this research. The findings of this study are divided into two parts. In the first part (7.2.1), we provide a summary of the findings from the literature review, and in the second part (7.2.2), findings from the case study are summarised. The third section (7.2.3) summarises the central aspect of the omniflow framework.

7.2.1. Findings from Literature

7.2.1.1. Main Dimensions of Flow Experience

This study has characterised the flow experience in omnichannel retail along three dimensions. These are i. continuity, ii. consistency, and iii. emotional and cognitive fit. Continuity refers to the seamless progression of the shopping journey across different channels. This means that customers can transition smoothly between channels that have been integrated by the retailer, from the search and purchase phases to aftersales. Consistency, on the other hand, is the perception of the same benefits across different channels during the shopping journey. Emotional and cognitive fit refers to the extent to which customers' emotional and cognitive needs are met while transitioning across different channels.

7.2.1.2. Channel Integration Activities

Channel integration activities required for flow experience in omnichannel retail are identified as part of the literature review. These activities are integrated customer service, integrated customer traceability, integrated order fulfilment, integrated promotion, integrated transactions, integrated information access, integrated reverse logistics, integrated analytics, and integrated data privacy and security. Activities such as integrated customer service, integrated promotion, and integrated information access are related to customer interaction and directly affect the customer experience. On the other hand, integrated analytics, data privacy, and security activities are not directly visible to customers, even though they can lead to better customer experience.

7.2.2. Findings from Case Study

7.2.2.1. Challenges in Channel Integration Activities and Enabling Technologies

The case study highlighted various challenges associated with channel integration activities that affect flow experience, discussed in Section 4.3. These challenges include replicating the same level of customer service in the online environment as in physical stores, inconsistent promotions across channels, lack of real-time inventory updates across channels, non-interoperable technologies, and lack of information consistency between offline and online channels. To address these challenges, we have mapped out the

technologies that enable each of the identified channel integration activities (detailed in Section 4.4).

7.2.2.2. Challenges in Interaction Design

The case study also highlighted the challenges faced by IR in terms of interaction design, discussed in Section 4.2. The main challenges identified are i) the disconnection between touchpoints across the different channels and their underlying systems to support flow experience, ii) the lack of a holistic design perspective to create alignment and flow along the customer journey involving third-party touchpoints, iii) the limitation of conventional design and evaluation approaches.

7.2.3. Omniflow Framework

The objective of the omniflow framework was to address the challenge retailers face in designing interactions that can enhance the flow experience for their customers across different channels. The development of omniflow work was a culmination of an iterative approach combining approaches such as multi-level design (Section 2.4.3) and information architecture (Section 2.4.4) from literature and then refined based on the results from evaluation in the case study. The design framework provides a low-level integration between three levels of design i. System design ii. Encounter design, and iii. Assessment design. The design framework is discussed at length in Chapter 5 and summarised here.

System design refers to the overall structure and organization of the omnichannel interaction system. Encounter design refers to the specific interactions that occur during the customer journey. This includes the flow of the encounter and the information exchanged between each touchpoint. Assessment design refers to the identification of metrics used to assess the flow experience of the customers and the relevant sources to get this data.

Integrating system, encounter, and assessment design involves considering how these three elements work together. The proposed design framework considers the importance of consistency between different levels of design, from the high-level system design to the low-level encounter design, providing a holistic approach to design. This involves designing systems and encounters that are accessible and responsive to customers' choices and using assessment results to inform the changes in encounter design that meet the unique needs of different customers.

The results of the evaluation confirmed that the proposed design framework offers a practical solution to retailers in enhancing their customers' flow experience. The evaluation also confirmed that the omniflow framework describes the interdependent nature of omnichannel retail interaction design and displays its complexity in a visually understandable manner. Feedback from subject matter experts in IR also suggested that this information architecture is essential for encounter design, as it covers the information requirements for a frictionless customer journey and facilitates information flow.

7.3. Contributions of the Study

Overall, the research has significant knowledge contributions and important implications for practitioners. These contributions and implications are discussed in the sections below.

7.3.1. Theoretical Contributions

This research has six main knowledge contributions in three different research areas. First, to the interaction and service design literature by i) updating multi-level interaction design with the addition of assessment design level, ii) combining retailers' and customers' perspectives in the system, encounter and assessment design, second to the customer experience theory by iii) identifying the dimension of flow experience and iv) identification of metrics to measure flow experience and third, to the omnichannel retail literature by v) mapping of effective technologies to channel integration activities. Lastly, this research brings together these three streams of research and proposes vi) design principles linking flow experience dimensions with the design of technology-enabled interactions.

7.3.1.1. Advancement of Interaction and Service Design

i. This study extends multi-level interaction design theory by adding assessment design level and providing alignment between system, encounter, and assessment level design.

The omniflow framework (multilevel interaction design framework) presented in this research builds on the work of Patrício et al. (2011) and Teixeira et al. (2017). The study's findings support previous research that shows that multi-level design alignment leads to a seamless experience (Teixeira et al., 2017; Tuunanen et al., 2022). The omniflow framework proposed in this study, however, differs from MSD (Patrício et al., 2011) and MINDS (Teixeira et al., 2017) in that it proposes the inclusion of assessment design as a part of the

multilevel design process, which wasn't part of either of the MSD or MINDS. It highlights the diverse knowledge fields required in the omnichannel retail design, including customer experience, interaction design, and service design, and confirms the findings of other researchers who have emphasized the need for multi-level alignment in retail interaction design (Teixeira et al., 2017; Tuunanen et al., 2022).

ii. This study combines retailers' and customers' perspectives in the proposed system, encounter and assessment design in the omniflow framework.

By combining retailers' and customers' perspectives, this study serves as a response to the calls for developing design approaches combining different perspectives (Hollebeek et al., 2022; Kranzbühler et al., 2018; Vrontis et al., 2017). The system design model accounts for diverse aspects of the omnichannel retail ecosystem and the relationships between them from both retailers' and customers' perspectives. Specifically, it offers ways to design changing scenarios of retail customer experience, depicting the different interaction links with retailer-controlled factors, third party technologies and services, customer characteristics, and customer-to-customer interactions. With the proposed encounter design, the study presents an information exchange mechanism between the retailer's own touchpoints (retailers' perspective) and also the other touchpoints customers might use in their customer journey not controlled by the retailer (customers' perspective). The current literature in an omnichannel setting has primarily focused on retailers' touchpoints in terms of design. Some exceptions include the recent work of Quach et al. (2021), which examines service integration actions. Assessment design also brings together both the customer and retailer perspectives in terms of proposing metrics based on retailers' systems as well as through customer feedback.

7.3.1.2. Flow Experience Dimensions and Measurement Metrics

iii. This research identifies and defines three main dimensions of flow experience: continuity, continuity and consistency, and emotional and cognitive fit.

The study contributes to the omnichannel customer experience theory by identifying and defining the key dimensions of flow experience. By proposing the dimensions of flow experience, this study adds to the limited number of studies that have taken a more comprehensive approach to understanding the omnichannel customer experience (Chang & Li, 2022; Cocco & Demoulin, 2022; Shen et al., 2018; Shi et al., 2020). Two of the identified

dimensions (continuity and consistency) are in line with the proposed dimension by Cocco and Demoulin (2022) and Shi et al. (2020), but this research adds a third dimension (emotional and cognitive fit) to provide a comprehensive understanding of flow experience. The study also contributes to a clearer understanding of the differences between retailer-controlled channel integration and the flow experience in the customer journey, which extends beyond the retailer's control. This finding is consistent with Cocco and Demoulin (2022) findings.

iv. This study identifies 12 key metrics to measure flow experience in omnichannel retail.

We identify the key metrics required to evaluate flow experience, thereby extending pivotal research on omnichannel customer experience measurement (Kuehnl et al., 2019; Marutschke et al., 2019; Palazón et al., 2022). We identified 12 metrics across three dimensions of flow experience that can be used to observe the flow experience of a retailer across online and offline channels. This brings together and adds to the work of Palazón et al. (2022), who proposed indicators from a firm perspective and Kuehnl et al. (2019) and Marutschke et al. (2019), who proposed measurement instruments from a customer perspective. Secondly, this study identifies measures for the touchpoints outside the retailers' control, as opposed to the studies mentioned above that only looked at retailer-controlled touchpoints. Thirdly, the study identifies data sources in different channels for gathering data for each metric from different systems as well as customers and observations. The extant work on flow experience measurement scales (Kuehnl et al., 2019; Marutschke et al., 2019; Palazón et al., 2022) depends only on collecting data from surveys and observations.

7.3.1.3. Effective Technologies for Channel Integration

v. This is one of the first studies to map effective technologies to channel integration activities.

The study's results extend our knowledge of omnichannel retail by specifying the use of digital technologies for the identified channel integration activities. This is one of the first studies that provide this mapping in the context of omnichannel retail. Technology mapping studies exist in other areas, such as Senna et al. (2021) mapping for supply chain activities, but this is the first technology mapping for channel integration activities. The findings from the mapping study also align with previous research on customer experience, emphasizing

the significance of integrating different channels using digital technologies to improve the shopping experience (Cocco & Demoulin, 2022; Parise et al., 2016; Savastano et al., 2019).

vi. The study proposes design principles linking the dimensions of flow experience and the design of technology-enabled interactions.

This research brings together three research streams and contributes to interdisciplinary research at the intersection of service design, customer experience, and omnichannel retail. The proposed design principles connect together the research from customer experience research in marketing to interaction design research in service design in the context of omnichannel retail. This research opens up possibilities for future study at the intersection of these fields.

7.3.2. Managerial Implications

The study offers practical insights to retailers on improving the omnichannel experience for their customers. The results and outputs from this research can benefit retailers from organizational, technical and social perspectives.

7.3.2.1. Organizational Perspective

From an organizational perspective, the proposed design framework and design principles guide the design process of customer-retailer interactions, incorporating various internal and external touchpoints, which help facilitate customer-retailer interactions and lead to positive customer experience. The study provides a tested design framework that can help retailers ensure that customers' requirements from each touchpoint are effectively integrated with retailer-provided experiences at all touchpoints. Moreover, the study provides valuable insights into the alignment between different levels of design.

As the number of channels increases, the interactions become more complex. Thus, creating an optimal environment that facilitates flow relies on a holistic interaction design approach is critical for omnichannel retailers. A narrow or limited design approach increases the risk of customer confusion, especially as customers fluctuate between various channels at their discretion. This holistic view allows for a complete understanding of the omnichannel flow experience. For example, customers sharing their shopping experiences on social media is a significant touchpoint in the omnichannel shopping experience, even though it is not directly controlled by the retailer. Retailers can improve this transition by

utilizing APIs to capture the relevant information, which leads to a better experience for customers and a deeper understanding of the customers' needs for the retailer.

This study also has practical implications for retailers regarding the key metrics that they should employ to measure customer experience. Retail managers need to acknowledge that flow experience constitutes a critical component of the overall customer experience and assess it in a manner that distinctly illustrates how different touchpoints interact over time and either facilitate or impede customer progression through the purchase stages (Marutschke et al., 2019).

Our mapping linking technologies with channel integration activities can be used as a guideline to focus on technologies identified for certain aspects of channel integration to take advantage of the complementary role of all the channels. By identifying the most important channel integration activity, retailers can prioritize their technology selection. The retailers can identify the most critical channel integration activity for their strategy and start with technology selection and implementation for that particular activity. For example, if a retailer such as IR wants to start with integrated customer service, so by using our mapping guidelines, they can zoom into mobile technologies, augmented reality, AI and cloud computing and the already successful implementation of these technologies by other retailers.

Lastly, retailers can prioritize their investments and develop profitable management strategies based on the dimensions identified in the study. By aligning their investments and strategies with the most important activities for their customers, retailers can maximize the impact of their resources. However, retailers need to build the internal capacity and capabilities to exploit the full potential of the aforementioned technologies to utilize the benefits of integrated channels. Retailers will only be able to implement most of the technologies (e.g., IoT, AI) if they have built the required capabilities to utilize these technologies.

7.3.2.2. Technical Perspective

From a technical perspective, it can help implement new services or update current services within an omnichannel interaction system, as shown in the demonstration of the framework (Section 6.2). It is important to ensure that the different systems have been designed or implemented with open interfaces that allow for the easy exchange of information. This can

be achieved by using standardized connectors that eliminate the need for custom integration. These integrations should be across different technologies as different types of technologies provide product-related information and can respond to customers' verbal or physical interactions to provide relevant details QR codes, mobile devices, standalone kiosks, interactive displays, smart shelves, virtual reality devices, and augmented reality display that can present product, offers and prices.

For example, in terms of encounter design, norm and information objects can contribute to the retailer's data warehouse design and metadata management. However, advanced technology provisions should be provided, keeping in mind that retailers must make sure they are protecting personal information when collecting data throughout this process.

Retail managers must develop a systemic view of the use of digital technologies in order to better seize the current and future opportunities offered by channel integration. Some retailers (e.g. Amazon, Macy, H&M, Zara) are using identified technologies to support some of the identified channel integration activities. Still, retailers are not taking full advantage of the benefits offered by these technologies for channel integration. For example, beacons have been mainly considered for fulfilling location-based customer experience and promotions, but with beacon gateway, there is an aspect of using beacon technology for integrated analytics. Similarly, mobile technology is one of the main enablers of omnichannel and its different features can be exploited in various forms as means of reducing the physical-digital divide between the in-store and online shopping experience.

7.3.2.3. Social Perspective

From a social perspective, the study also highlights the importance of having an information-sharing mechanism in place to improve the customer's shopping experience. By providing customers with access to relevant information, regardless of the channel they are using, retailers can increase customer satisfaction and loyalty. Having an information-sharing mechanism in place can help improve the customer's shopping experience by providing them with the information they need when they need it, regardless of which channel they are using. This can lead to increased customer satisfaction and loyalty, as customers are able to easily access the information they need to make informed purchase decisions. There are also some relatively easy changes retailers can make based on the identified dimension of flow experience. For example, they can ensure consistency by consistent branding across

channels. This includes using the same logo, colour scheme, and typography on a retailer's website, mobile app, and physical store. This helps customers easily recognize a retailer's brand and navigate between different channels with ease. They can also organize information in a logical and hierarchical manner. This means arranging information in a way that reflects the importance and relevance of different pieces of information to customers.

Advancements in technologies and social networking have enabled third parties to become a direct part of the customer experience process, and research requires a better understanding of how to design customer experiences that account for these third-party interactions.

7.4. Business Implications

The findings of this research also carry business implications for retailers in terms of their financial performance, market dynamics and competitive advantage. Implementing the omniflow framework can potentially have significant financial benefits for omnichannel retailers. By adopting the framework, retailers can differentiate themselves from competitors by offering a superior customer experience, gaining a competitive edge, and capturing a larger market share.

Examining the case of implementation of the omniflow framework in IR, in the period after the launch of their virtual reality store developed using the omniflow framework, IR experienced a 30% increase in online sales year-on-year. This substantial increase in online sales represents a significant revenue boost for the retailer within a relatively short time frame. There were other factors that could have attributed to this large increase as attribution to just one factor is not easy in the real-world cases. There was also a 50% increase in the retention rate of IR's customer base post the launch. This improvement in customer retention further enhances the retailer's financial performance by fostering long-term customer loyalty and repeat business. The substantial growth in online sales and the increased customer retention rate highlight the potential for retailers to achieve significant revenue growth and establish a competitive advantage by designing innovative interactions utilizing the emerging technologies. The successful implementation of the omniflow framework and its positive impact on the interaction design also convinced the IR management to approve the addition of new virtual reality stores. These new stores are specifically tailored to meet the demands and preferences of particular international markets. This strategic expansion further

exemplifies the potential financial benefits of leveraging the omniflow framework to develop integrated interactions.

In addition to financial implications, the findings from this research can have broader effects on market dynamics. By enhancing the flow experience and providing a seamless omnichannel customer journey, retailers can attract more customers, leading to increased market demand for their products and services. Furthermore, implementing the framework allows retailers to differentiate themselves by providing a consistent and seamless customer experience. The holistic approach of the multi-level interaction design also enables retailers to adapt to changes in the competitive landscape and evolving customer expectations, maintaining a competitive advantage over time.

Improving the customer experience and enhancing flow across channels can lead to increased customer loyalty and higher sales revenue, contributing to revenue growth. By addressing challenges in channel integration and interaction design, retailers can reduce inefficiencies and costs associated with inconsistencies and disjointed customer experiences, ultimately improving profitability. However, the interaction design using the omniflow framework may require investments in technology, systems integration, and employee training. Therefore, retailers need to effectively assess and allocate resources to support the implementation process.

7.5. Research Limitations

This research provides a comprehensive framework for designing technology-enabled interactions for enhancing flow experience across multiple channels. However, it is essential to acknowledge certain limitations. Firstly, this study is geographically restricted to the EU, where the applicability of GDPR significantly affects technology-enabled interaction and the customer journey. Consequently, the generalizability of the research to other geographical areas, such as China and the USA, may be limited, as the absence of strict data privacy laws alters how retailers collect data to enhance future interactions with customers.

Secondly, this work aims to develop a design framework for technology-enabled interaction when customers move from one channel to another. Although the experience after the transition affects the customer experience, it is beyond the scope of this study. Furthermore,

other aspects of the retail business may influence design decisions, but these are also outside the scope of this research.

Thirdly, the study focuses on a particular industry (retail) and channels; therefore, the findings' generalizability to other industries may be limited. This study is limited to the retail product industry within the retail sector. Although there may be overlaps with the retail service industry, the research does not claim applicability in that context.

Fourthly, using a single case study approach for problem identification and evaluation limits the generalizability of the findings. The results may not be easily transferable to other contexts. Moreover, this study's primary data collection was through qualitative methods, which have limited generalizability, as is the case with any other qualitative research. However, such methods are suitable for in-depth understanding, which was required for this study.

Fifthly, the researcher's perspective is inherent in the artefact's design, which aligns with the interpretivist paradigm underpinning this research. The research relied heavily on the perspectives of retail managers and designers, and direct customer feedback was limited.

Lastly, the research takes into account the evolving nature of technology. However, any disruptive technology can render the framework outdated, as the conditions that apply to current technologies may not apply to new technologies.

7.6. Recommendations for Future Research

The findings and limitations of this research suggest several areas that could be explored in future work to enhance the development of technology-enabled interactions for flow experience across multiple channels.

Firstly, while this research provides a set of design principles for flow experience, conducting further empirical studies to validate and refine these principles would be beneficial. Further studies could involve testing the design principles with a larger sample of users across various industries and contexts. This would provide more extensive evidence of the effectiveness of the design principles and contribute to the development of a more robust framework.

Secondly, the proposed design framework and principles focus primarily on flow experience; it would be valuable to investigate how these principles can be integrated into a broader retail design framework. Additionally, we recommend future empirical studies to assess the impact of the omniflow framework on a firm's overall performance.

Thirdly, we encourage researchers to examine the relative impact of customer and third-party touchpoints on the flow experience, both separately and collectively. There has been relatively less research conducted in this area. However, the omniflow framework highlights the importance of considering these touchpoints in the context of customer engagement and provides a foundation for future research to explore their role more thoroughly. For example, email correspondence and online chat interactions may be seen as in-between touchpoints. Further research could be conducted to understand the impact of these interactions on customer behaviour and overall experience. This study also provides a more nuanced understanding of the interplay between different types of touchpoints and can inform the development of new theories and models related to customer experience. Our conceptualization of the flow experience opens up areas for research on various customer journey, engagement, and experience topics. The study's classification of touchpoints in terms of the level of interaction can also be a foundation for further enquiry into the role of each type in flow experience.

Fourth, the framework may require updates and modifications over time because of changes in the technology landscape. Future research can address this by developing methods to identify and incorporate disruptive technologies into the design principles and framework. Additionally, future research could incorporate customer feedback during the design and evaluation process to address the limitation of the data collection for evaluation in this study being done only using retailer managers and designers.

Fifth, this research also contributes to the interdisciplinary research at the intersection of service design, customer experience design, and omnichannel retail. By developing a comprehensive design framework based on concepts from these fields, the research opens up possibilities for future study at the intersection of these fields. The proposed framework can be used as a starting point for further interdisciplinary research in the retail context.

Lastly, future research could expand on this study by including a wider range of industries beyond retail, such as healthcare or finance, to examine how the design principles can be

applied to other contexts and industries. This would enable the development of a universal framework that can be used across multiple sectors and settings.

7.7. Reflections on the Research Journey

The PhD journey at Maynooth University has been a transformative and intellectually stimulating experience that has significantly shaped my development as an academic. The research journey commenced with the broad objective of investigating technologies and technology-related practices to enhance customer experience in digital retail. Engaging early on with an omnichannel retailer, as presented in this thesis, provided a real-world context for grounding the study and narrowing down the research topic. The subsequent critical step involved selecting an appropriate methodology. I believe that is one of main decisions during PhD research. The design science research methodology was an appropriate fit due to its alignment with the research questions and objectives. Learning about the methodology in detail for my PhD by reading and also by attending modules and summer schools on design science research has left me in good stead to not only use the methodology for my future research but also contribute to the development of the methodology.

Upon reflection, several other noteworthy milestones and achievements stand out in my research journey. The first major milestone was the formulation of the problem statement that laid a solid foundation for the subsequent stages of the study. The findings from the problem identification phase were subsequently published in the proceedings of the Information Systems Development conference in 2019, and the paper titled “Omnichannel value chain: mapping digital technologies for channel integration activities” was recognised as one of the best papers presented at the conference. The submission and subsequent presentation in the conference exposed me to the information systems research community, deepening my understanding of the rigorous publication process and highlighting the importance of high-quality outlets.

The design of the omniflow framework was another milestone of the research journey. The process of developing the framework, which forms the core of the research, involved synthesizing concepts from different disciplines and refining them based on evaluation results. The iterative nature of the design science research process allowed for continual refinement and improvement, informed by insights from the literature and ongoing collaboration with practitioners, thereby highlighting the value of collaboration and the

significance of continuous learning. This approach allowed me to understand the importance of integrating theoretical knowledge with practical insights gained from real-world application. It also underscored the significance of incorporating concepts from different disciplines. Another achievement during my PhD was to work with colleagues from outside my university related to the topic of my PhD. One of these engagements with colleagues from outside the university resulted in a publication. The paper titled "How can Older Adults Shop Online in the Future? Developing Design Principles for Virtual-Commerce Stores?" was accepted in European Conference on Information Systems and was awarded runner-up award for the best paper. This interdisciplinary and international interaction further reinforced the importance of collaboration and effective communication for successful research outcomes.

The Ph.D. journey fostered a deeper understanding of the research domain, cultivating a sense of intellectual curiosity. It has been a profound and rewarding experience, equipping me with valuable skills, knowledge, and perspectives. It has not only expanded my academic knowledge but has also facilitated personal growth and self-reflection. However, the journey was not without its share of challenges. These challenges included keeping up the engagement level with practitioners throughout the three years, ensuring rigour while keeping the content engaging for practitioners, receiving critical comments from reviewers, and improving your work and not get depressed. This whole process helped me to sharpen my analytical and problem-solving skills, enabling me to tackle complex issues with confidence. Engaging with subject matter experts and stakeholders in the industry provided valuable insights and enabled me to bridge the gap between academia and practice. The PhD journey also emphasized the importance of resilience and perseverance when confronted with setbacks and hurdles along the way.

The research journey's milestones, challenges, and lessons learned have strengthened my commitment to academic excellence, innovation, and the pursuit of knowledge. I plan to take the lessons from this work on board for my future research endeavours and contribute to the advancement of knowledge in the areas I work in.

7.8. Final Remarks

As the retail industry evolves, it is clear that focusing on experience across channels is of critical importance. This thesis has explored the technology-enabled interaction design for

flow experience across channels, providing a design framework to assist retail practitioners (designers and managers).

There were three main objectives stated at the start of the research, which shaped and influenced the research work. These objectives included the identification of the dimension of flow experience, developing a design tool to help retailers design technology-enabled interactions for enhanced flow experience and development of guidelines for applying this approach. These objectives were successfully met.

The study followed a design science research approach to conduct this research, and a long engagement with IR provided ample opportunities for data collection and design evaluation. This thesis has demonstrated the completeness, usefulness and effectiveness of the proposed omniflow framework and the associated design principles. These enable retailers to design interactions allowing customers to move seamlessly between channels and enhance their flow experience.

Overall, this research has highlighted the need and effectiveness of a holistic, multi-level, multi-perspective (retailer and customer) approach to technology-enabled interaction design in omnichannel retailing.

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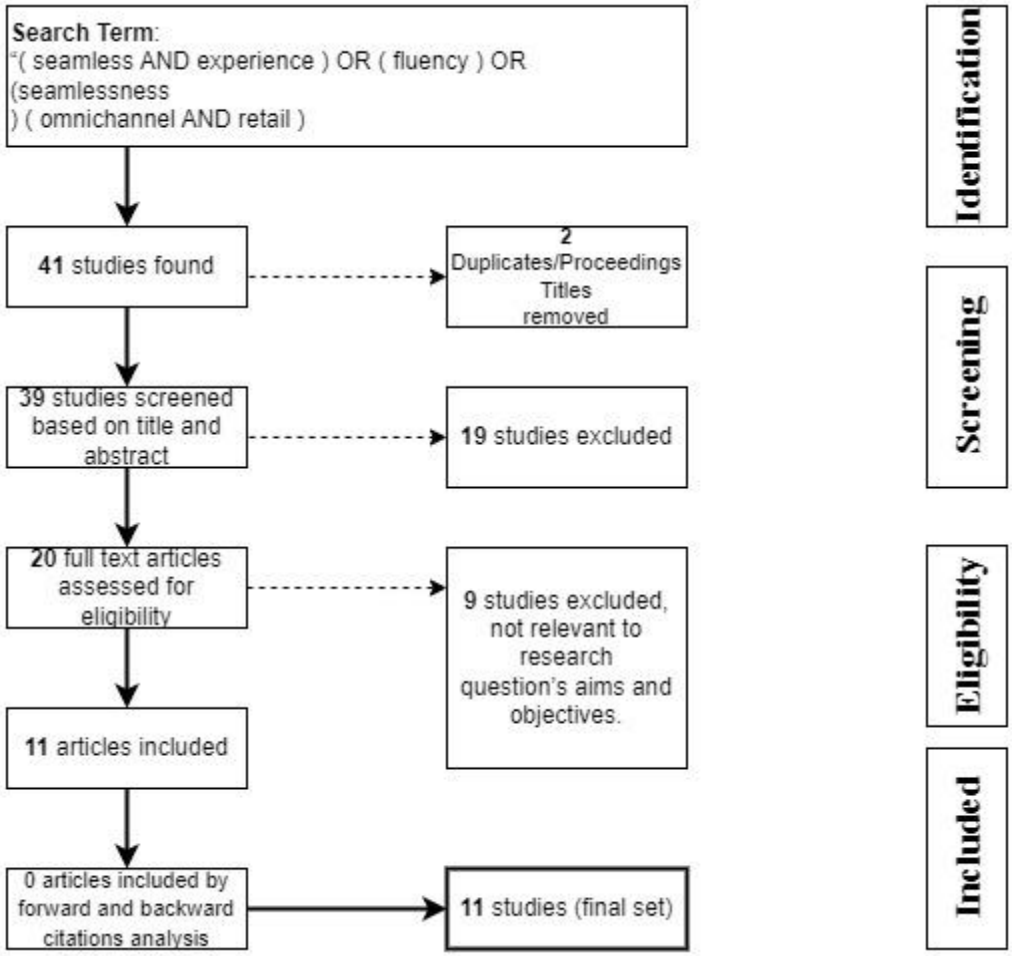
Appendix A - Literature Review Process – Flow Experience

In the first step of the literature review process, search was conducted in the SCOPUS database using the search terms "(seamless AND experience) OR (fluency) OR (seamlessness) OR (flow) AND (omnichannel AND retail))". The initial search yielded a total of 41 articles, which were then assessed for relevance to the research question.

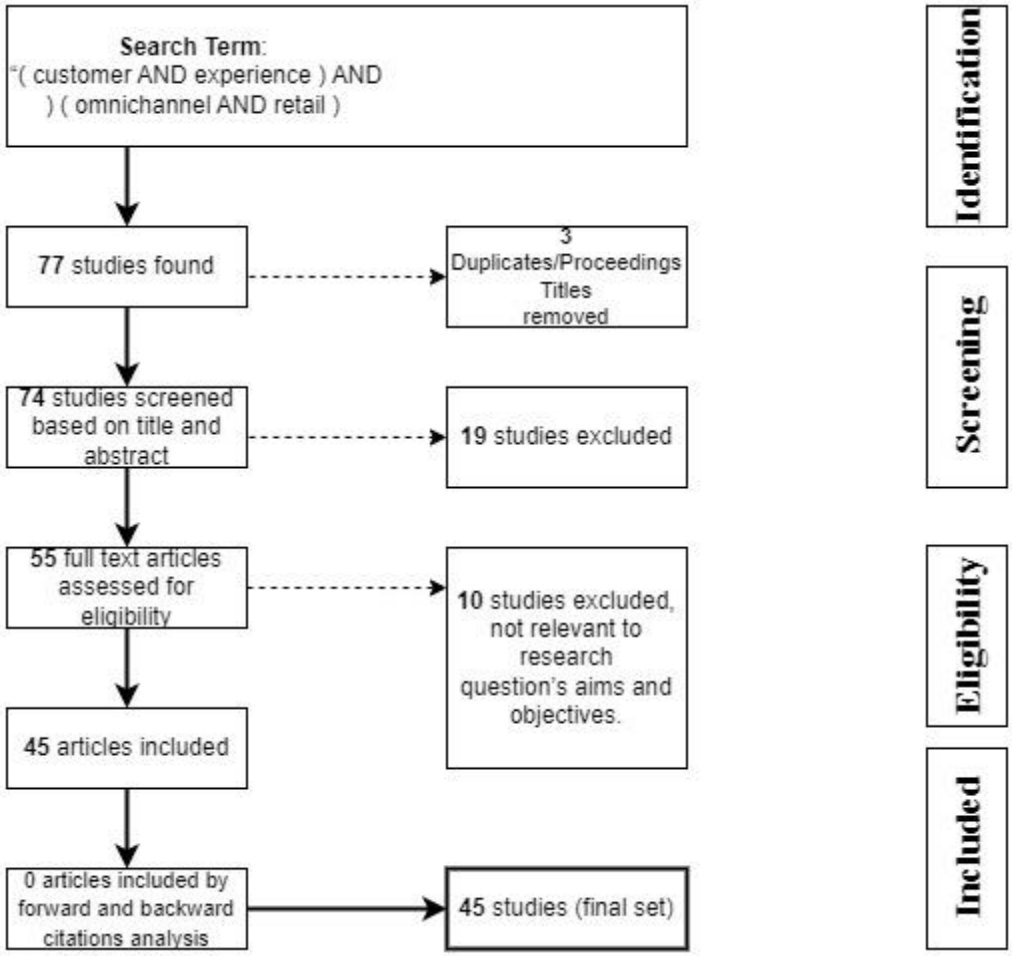
Next, we conducted a preliminary screening of the articles by reviewing their titles, abstracts, and keywords. This helped us identify articles that were clearly irrelevant to our research question, and we excluded them from the final selection. In the next step, we conducted a detailed review of the remaining articles to assess their quality, relevance, and contribution to the research question. We examined the methodology, findings, and conclusions of each article to ensure they met our selection criteria. After the detailed review, we identified 11 articles that met our selection criteria and were relevant to our research question. These articles were then shortlisted for further analysis and were included in our literature review. Overall, the literature review process helped us identify 11 high-quality articles that provided valuable insights into the relationship between omnichannel retail and the seamless experience. The process also ensured that we only included articles that were relevant to our research question, making our literature review more focused and impactful.

Appendix A - Literature Review Process – Flow Experience



Appendix B - Literature Review Process – Customer Experience

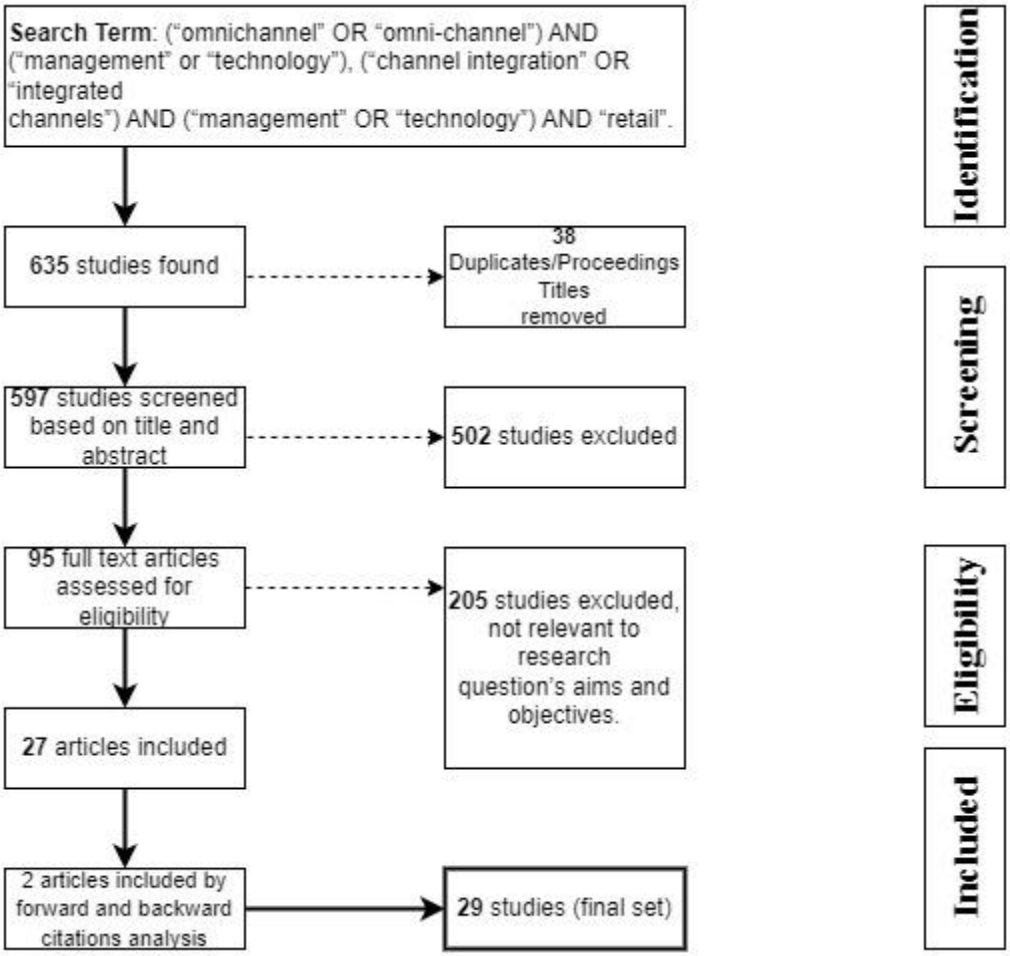
The systematic literature review was conducted using an evidence-based approach: Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) Protocol (Moher et al., 2009, 2015). This protocol was administered using a four-step process (identification, screening, eligibility and inclusion) to ensure objectivity, transparency and reliability (Kranzbühler et al., 2018). Consistent with prior review studies in information systems research (e.g. Koivisto and Hamari, 2019), Scopus database was used for the search process. In the first step, the keywords were identified for the search by focusing on the seminal publications in the field and using keywords indexed in these studies and adding/removing as per our research objective. The initial screening based on titles and abstracts resulted in the inclusion of 77 articles. In the third phase of the process, the 77 articles were assessed based on full-text eligibility. In this step, 32 articles were removed, which resulted in the inclusion of 45 articles in this review.


Search Term:
"(customer AND experience) AND
) (omnichannel AND retail)
77 studies found
3
Duplicates/Proceedings
Titles
removed
74 studies screened based on title and abstract
19 studies excluded
55 full text articles assessed for eligibility
10 studies excluded, not relevant to research question's aims and objectives.
45 articles included
0 articles included by forward and backward citations analysis
45 studies (final set)
Identification
Screening
Eligibility
Included

Appendix C - Literature Review Process – Channel Integration

We applied the search using keywords channel integration, omnichannel, technology and retail in three different databases for maximum coverage of omnichannel retailing literature i.e., Scopus, Science Direct and Web of Science. We used different combinations from the keywords to better understand the occurrence of the results such as (“omnichannel” OR “omni-channel”) AND (“management” or “technology”), (“channel integration” OR “integrated channels”) AND (“management” OR “tech-nology”) AND “retail”. This search resulted in total of 635 articles. Afterward, we excluded duplicates, articles not published in English and published before 2012. We only considered literature after 2012 as the term ‘omnichannel’ was coined in literature in 2011 by (Rigby, 2011) and most of the research related to channel integration for omnichannel retailing has been published after that.

Subsequently, we examined the sum of identified articles to evaluate whether the articles could contribute to this paper and excluded articles not topic-related, for ex-ample, articles regarding foreign market channel integration. We also excluded arti-cles from unrelated disciplines to this research such as refrigeration science and tech-nology, chemistry, applied mechanics, etc. After screening the remaining articles for the contribution to the study, 29 articles were selected, which were then used for defining the channel integration activities for flow experience.


Search Term: ("omnichannel" OR "omni-channel") AND ("management" or "technology"), ("channel integration" OR "integrated channels") AND ("management" OR "technology") AND "retail".
635 studies found
38 Duplicates/Proceedings Titles removed
597 studies screened based on title and abstract
502 studies excluded
95 full text articles assessed for eligibility
205 studies excluded, not relevant to research question's aims and objectives.
27 articles included
2 articles included by forward and backward citations analysis
29 studies (final set)
Identification
Screening
Eligibility
Included

Appendix D- Literature Review Process – Customer-Retailer Interactions

To conduct this literature review we adopted a narrative approach to evaluate and summarise the existing knowledge.

To perform this review, relevant keywords and topics were identified and searched for in SCOPUS and Google Scholar databases. A combined search was carried out using terms such as "customer experience," "service experience," and "consumer experience," in conjunction with "touchpoints," "touch points," ""interactions," "interaction," "customer journey," and "encounter." Additionally, the review process employed a "snowball" technique to identify seminal papers and other valuable and pertinent sources of information that were not found in the original search results. This step was necessary because the review uncovered several significant publications that was essential sources of influence but were not initially included in the search results.

Appendix E- Interview Guide – Problem Identification

Introduction:	Introduction by the researcher Purpose and expected time of the interview
Background Questions:	Role, Experience
Main Questions:	• From your perspective, what are the biggest challenges in the alignment of offline and online channels at your company? • Can you give me examples of the specific challenges you have encountered while implementing the omnichannel strategy? • What do you think are the most important factors for the success of the omnichannel strategy? • What steps have you taken or are you planning to take to make your channel integration more effective? • How do you plan technological changes that impact customer experience?
Follow-up Questions:	• What challenges have you encountered with implementing cross-channel technology solutions, and how have you addressed them? • What steps have you taken or are you planning to take to make the technology interactions more convenient for customers?
Conclusion:	Follow up details

Appendix F – Interview Guide - Evaluation

Introduction:	Introduction by the researcher Purpose and expected time of the interview
Background Questions:	Role, Experience, use of omniflow framework
Main Questions:	How did you use the design framework? Was it useful, effective for you? In what way is the framework i) useful, ii) effective for you? Do you see any missing elements in the design framework? Would any additions to the design framework make it more i) useful, and ii) effective for you? How can the design framework be improved? (Same questions for each of the constituent design levels i.e., system, encounter and assessment design)
Conclusion:	Follow up details