

The Influences of Mobile Channel Configurations on Channel Integration Quality in Cross-Channel Electronic Commerce

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ABSTRACT

Many retailers have extended their extant online channels (i.e., websites) to mobile channels for communicating with and delivering their products or services to customers. However, retailers have trouble delivering a cohesive and seamless customer experience across the Web and mobile channels. To address this challenge, we propose a way for retailers to enrich customers' seamless experiences across channels by configuring mobile channels (functionality- and interactivity-oriented configurations) along with traditional Web channels. This study theoretically contributes a research framework that posits the role of mobile channels as an extension of existing websites. It also provides practical insight for effectively articulating an e-commerce strategy in cross-channel electronic commerce.

Keywords: Cross-Channel Electronic Commerce, Seamless Customer Experience, Channel Integration Quality, Mobile Channel Configuration

I . Introduction

Along with advanced mobile technologies, mobile channels have been rapidly regarded as some of the most popular and valuable retail channels; both consumers and retailers have realized numerous benefits from mobile channels (Oracle, 2011). In retailers'

perspectives, mobile channels, as the extension of retailers' traditional web channels, may enhance stakeholders' values. Many retailers have launched and utilized customized mobile channels (e.g., mobile sites and mobile applications) as tools for communicating with and delivering products or services to customers, along with their traditional web channels

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(e.g., websites).

In line with mobile channels, cross-channel electronic commerce (CCEC)¹ has been highlighted in online shopping environments. Extending the concept of cross-channel commerce (Sousa and Voss, 2006), CCEC can be defined as a commerce for communicating with and delivering products or services to customers through two or more online channels in electronic commerce (e-commerce) environments. Reporting that more than three-quarters of consumers often visit two or more channels to purchase a product or service, Oracle (2011) suggests that “retailers need not necessarily serve up the identical experience in each channel, but rather they can optimize and connect channel interactions to deliver consistent user experiences” (p. 4) to be successful in the CCEC. Hence, retailers have invested in the mobile service as a valuable channel for e-commerce; they also ensure to provide a seamless customer experience across various channels including websites, mobile sites, and mobile applications (Adobe, 2010; Lamont, 2012).

Despite the significance of customers’ seamless experiences in CCEC, retailers may be faced with difficulties in delivering seamless experiences across various channels (Fodor, 2012). According to a recent report (Compuware, 2011), 57 percent of mobile web users would not recommend a business with a bad mobile site, and 40 percent of users have turned to a competitor’s site after a bad mobile experience. Consequently, customers’ bad experiences on mobile channels discourage them to return to, or recommend, specific mobile sites, applications, and/or websites. In addition, retailers have trouble in delivering customers’ seamless experiences across channels

due to some challenges posed by the unique constraints of handheld devices such as small screen size and limited memory (Adipat et al., 2011; Zhang, 2007). Furthermore, Lee (2007) suggested that the extension of traditional channels to new channels causes customers to face uncertainties that have not been experienced in traditional channels. Despite the importance of understanding cross-channel, little research has been conducted to determine how retailers can facilitate a seamless customer experience in CCEC.

To fill this knowledge gap, we propose the following research question: *What are the salient factors that influence a seamless customer experience across retailers’ various electronic channels, which, in turn, enhance customer satisfaction toward retailers?* In answering this question, we first adapt Sousa and Voss (2006)’s conceptualization of integration quality as a proxy of a seamless customer experience in CCEC. Integration quality is defined as “the ability to provide customers with a seamless experience across multiple channels” (Sousa and Voss, 2006, p. 365). We also draw on brand extension theory, a theory that deals with why customers of one channel extend their consumption to another channel based on the associate network memory model. This overarching theoretical framework helps us to develop how certain factors may foster a seamless customer experience across the web and mobile commerce channels. Then, we posit that customers’ perceived quality of channel integration is determined by the configuration of mobile channels with websites and that channel integration quality enhances customers’ overall satisfaction toward retailers.

This paper is organized as follows. We first describe the theoretical background regarding cross-channel electronic commerce (CCEC), a seamless customer experience across channels, and brand extension

1) Cross-channel is often used interchangeably with multi-channel or omni-channel (Fodor, 2012; Noble et al., 2009).

theory. Next, we propose our research model and pose several hypotheses regarding how mobile channels can be configured to enrich channel integration quality, which, in turn, influences customer satisfaction toward retailers in CCEC. Then, we discuss the research methodology used in this study and present the empirical results of our Partial Least Squares (PLS) analysis. Finally, we discuss the implications of our findings, the limitations of our study, and directions for future research.

II. Literature Review

2.1. Cross-Channel Electronic Commerce (CCEC)

One of the most dramatic trends in shopping environments has been the proliferation of channels through which customers can interact with firms, which is called cross-channel commerce (Neslin et al., 2006). Cross-channel commerce refers to commerce for communicating with and delivering the products or services to customers through two or more channels (e.g., physical store, catalog, website, mobile application) (Sousa and Voss, 2006). To gain more information about or to complete the purchase of a product or service, people often use diverse channels including computers, mobile devices, brick-and-mortar stores, catalogs, and customer service representatives (Oracle, 2011). These channels are not isolated from one another; rather, they overlap (Evans, 2009). For example, more than three-quarters of consumers use two or more channels to research and complete transactions when purchasing a product or service (Oracle, 2011).

Cross-channel commerce context has increasingly received attention from academics over the past dec-

ade (Hahn et al., 2009; Kwon et al., 2009; Sousa and Voss, 2006; Verhoef et al., 2007; Vishwanath et al., 2001; Yang et al., 2013; Yang et al., 2011). Prior studies on cross-channel commerce have investigated the effects of channel integration (Bendoly et al., 2005; Sousa and Voss, 2006) and interactions (Sousa and Voss, 2006; Yang et al., 2013), cross-channel consistency (Madaleno et al., 2007), channel extension and its synergies (Montoya-Weiss et al., 2003) on a variety of outcomes such as customer satisfaction and retention, customer relationship management (CRM), service quality, and new channel adoption. Chun and Kim (2007) addressed that cross-channel is advantageous to firms in terms of brand equity and integrated marketing by extending existing customer data to another channel. On the practical side, retailers have integrated their traditional channels with new channels because well-integrated cross-channel firms would be more successful than single-channel firms (Gulati et al., 2000; Sousa and Voss, 2006; Vishwanath et al., 2001).

Mobile channels offer ‘anytime, anywhere’ touchpoints to customers, provide customers with values by connecting them to Internet services traditionally accessed on desktop or notebook computers, and make it easier to use the Internet on their mobile devices. The ability to communicate at virtually any place and any time also offers an unprecedented level of flexibility, accessibility, and convenience to customers with the convergence of wired and wireless technologies (Adipat et al., 2011; Lamont, 2012). For instance, 26 percent of all consumers and 40 percent of the 18-to-34 age group consumers use their mobile devices to browse or research products and services at least four times a year (Oracle, 2011). Thus, regarding a mobile channel as an important facet of cross-channel electronic commerce could be important in understanding the interactions between

wired (websites) and wireless (mobile applications) channels for supporting consumers' e-commerce activities (e.g., transaction, purchasing, information search, online discussion). Therefore, the scope of this study focuses on *cross-channel electronic commerce (CCEC)*, referring to commerce for communicating with and delivering products or services to customers through two or more online channels in e-commerce environments.

2.2. Seamless Customer Experience

As cross-channel commerce provides the most compelling opportunity to retailers, many of them are trying to offer a unified cross-channel environment that keeps pace with customer expectations for faster, easier, and more fluid shopping experiences (Rigby 2011). Under this environment, customers are seamlessly shifting between various touch-points in order to shop, buy, and fulfill orders according to their preferences. To be successful in cross-channel environments, retailers need to achieve cross-channel integration because the lack of a consistent experience across channels can jeopardize the customer-business relationships (Madaleno et al., 2007; Neslin et al., 2006; Sousa et al., 2006). For example, Yang et al., (2006) posited that service compatibility, which refers to the degree to which mobile service provided by different media (or channels) is consistent, plays a salient role for customers in adopting mobile services in e-commerce environments. In this respect, failure to provide a consistent customer experience between channels may diminish customers' satisfaction toward retailers (Madaleno et al., 2007; Payne et al., 2005). Hence, retailers have recently considered mobile channels as the extensions of websites and have strongly attempted to link mobile channels to existing websites in commercial and business domains.

Despite the importance of a seamless customer experience across channels, however, many retailers still struggle to provide customers with seamless experiences in the e-commerce context (Fodor, 2012; Nielsen et al., 2005; West, 2011; Wright et al., 2013). This is because the convenience of mobile channels has been compromised by some challenges posed by the unique constraints of handheld devices (e.g., small screen size, limited memory), wireless networks, and the mobility of users (Adipat et al., 2011; Zhang, 2007). Most existing websites are designed and optimized for desktop only, such that they are not suitable for mobile applications with unpleasantness aesthetics, low legibility, or a small amount of information (Adipat et al., 2011). For example, while a mobile application (as one of the mobile channels) might be simple to use, its corresponding website may be complicated and frustrating (Tate, 2011). Practically, customizing mobile applications with a smaller screen size or utilizing the right development technologies to support the mobility for mobile applications leads developers to use different approaches in their design (Gualtieri, 2011). Jung and Hong (2014) emphasized the effects of metaphors in the user interface to increase users' intentions to use mobile applications. Therefore, the configuration of mobile channels leveraging existing websites can be critical in improving customers' integrative experiences in CCEC. Additionally, it enables customers to keep in touch with retailers, facilitates other business processes, and adds values to the era of quick communication (Adipat et al., 2011; Adobe, 2010; Gualtieri, 2011; RIS, 2011; RIS, 2012; Tate, 2011).

2.3. Brand Extension Theory

Brand extension theory explains that specific brand information is stored in a customer's memory and

can then be retrieved when a variety of associations about the brand are linked (Aaker et al., 1990). Since customers already possess established attitudes toward existing brands, they evaluate new extensions on the bases of those attitudes. Thus, brand extension theory suggests that the value of the brand is determined by a customer's combined attitudes of its current status and its potential in new untapped markets (Broniarczyk et al., 1994; Srivastava et al., 1991; Van Riel et al., 2005).

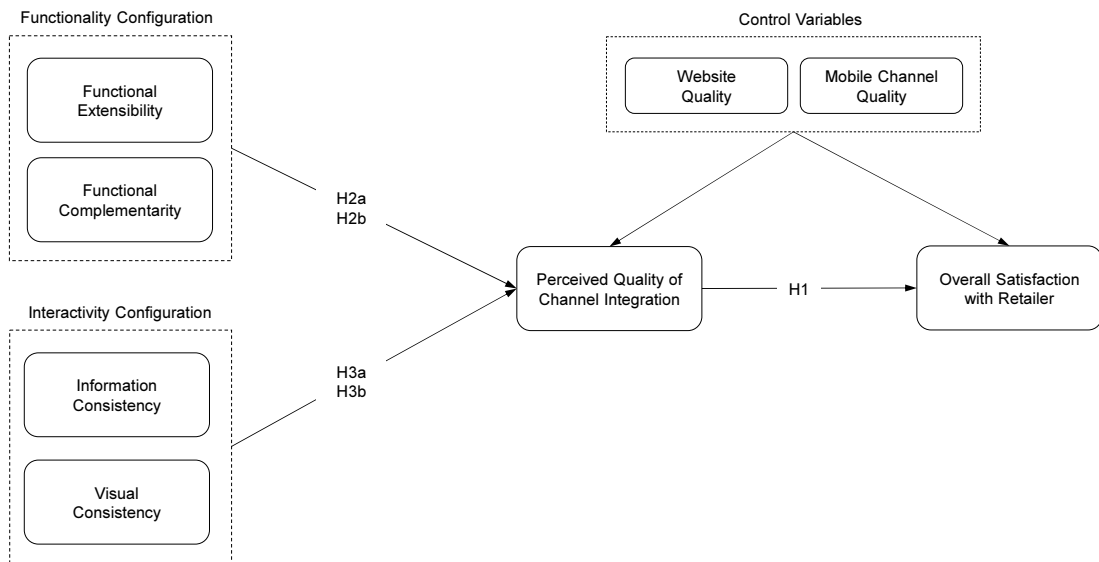
Many researchers have applied the concepts of brand extension in traditional offline markets (Aaker et al., 1990; Sharp, 1993; Shine et al., 2007; Völckner et al., 2006) as well as in online and e-service markets (Song et al., 2010; Van Riel et al., 2005). With the advancement of Internet and e-commerce, the concept of brand extension has extended to channel extension in the context of cross-channel or multi-channel commerce. Channel extension is defined as a dynamic process in which firms utilize additional channels in addition to the ones they currently use (Yang et al., 2011; Yang et al., 2013). Many retailers have become increasingly engaged in channel extension because it requires another strategic commitment to move from offline to online marketplaces (Yang et al., 2013). As cross-channel strategy with channel extension may help retailers enrich customer loyalty by consistently offering customer touch-points (Cassab et al., 2006; Kwon et al., 2009), retailers have attempted to leverage channel extension effects from a favorable offline channel to a relatively new online channel (Kwon et al., 2009; Yang et al., 2013). Therefore, brand extension theory provides a suitable theoretical basis for the current study.

In this study, we apply the brand extension mechanism to the CCEC context, which highlights the relationships between mobile and website channels. In the traditional e-commerce context, most customers

have used a single channel (usually website). However, as mobile channels have permeated our lives, customers have gradually developed into cross-channel users through channel extension. Thus, customer experiences with retailers in one channel may play a critical role in developing their perceptions and beliefs about the same retailers in another channel (Lee et al., 2007; Yang et al., 2013). Prior research suggests that the synergy across channels can be generated by the seamless integration that retailers provide to customers across channels and that it enriches customers' experiences with retailers by cultivating firms' brand images as well as customer loyalty in both channels (Gefen, 2000; Kwon et al., 2009). Therefore, in order to offer seamless customer experiences across channels, retailers need to effectively configure relatively new channels to be consistent with existing channels. When the existing image or reputation of retailers' websites as existing channels can be well transferred to mobile sites or applications as new channels, customers are likely to have more favorable attitudes toward retailers. (Kim et al., 2005; Kwon et al., 2009; Yang et al., 2013). Therefore, retailers have attempted to leverage channel extension effects from favorable existing channels to relatively new channels.

III. Research Model and Hypotheses

<Figure 1> depicts our research model that hypothesizes the relationships between the major theoretical constructs. Our theoretical perspectives—the concept of integration quality and brand extension theory—explain that, as customers are more likely to use mobile channels, the configurations of mobile channels with existing online channels (i.e., websites) can be critical for fostering customers' satisfaction



<Figure 1> Proposed Research Model

with e-commerce retailers by improving customers' perceived quality of channel integration (i.e., improving customers' seamless experiences) in the CCEC environments. In detail, we first propose that customers' seamless experiences, which are represented by customers' perceived quality of channel integration, influence overall satisfaction with retailers. Second, the perceived quality of channel integration is influenced by mobile channel configurations, which include functionality-oriented (functional extensibility and functional complementarity) and interactivity-oriented (information consistency and visual consistency) configurations of mobile channels. Website and mobile channel quality are considered control variables for overall satisfaction with retailers.

3.1. Seamless Customer Experience

The creation of new distribution platforms on various electronic devices has created new challenges for firms seeking to provide a seamless customer experience. With the growth of cross-channel mar-

keting, sales, and service, customers have learned to expect a high level of service output and service quality from firms (Wallace et al., 2004). Because customer experience can be built at all moments of contact with the firms in cross-channel settings (Sousa and Voss, 2006), offering a seamless and consistent experience across channels is important. Restated, the seamless experience plays a critical role in enhancing the quality of the customer-retailer relationships (Madaleno et al., 2007; Payne et al., 2005). Thus, retailers are beginning to see the need to ensure that every interaction with customers is seamless and indicates the quality of their products or services.

Cross-channel integration leads to enhances retailers' opportunities for interaction with customers through more than one channel (Payne et al., 2004). For example, the integration of information from various channels such as sales force, outlets, telephone, direct marketing, and e-commerce reduces operating costs while increasing customer satisfaction, sales, and profits (Payne et al., 2004). Furthermore, well-integrated channels encourage de-

sirable customer attitudes such as satisfaction and loyalty (Montoya-Weiss et al., 2003; Neslin et al., 2006). Clearly, retailers can benefit from integrating customer information from one channel into other channels.

3.2. Customer Satisfaction in Cross-Channel Electronic Commerce (CCEC)

The customer satisfaction framework can provide rich insight into the processes that affect customers' post-usage cognitive evaluations of products or services (Oliver, 1996). As a strong behavioral predictor, customer satisfaction is defined as a customer's evaluation and affective response to an overall product or service, or his or her response to the experience after using a product or service. Hence, overall satisfaction with a retailer is conceptualized as the overall evaluation of a customer's experience with a product or service (Madaleno et al., 2007).

Following the idea that customer satisfaction is derived from the quality of a customer's interaction with a product or service, we observe that one aspect of satisfaction with an electronically-delivered service is a service that is consistent and integrated, not causing cognitive dissonance for the customers. E-services have been defined as "all interactive services that are delivered on the Internet using advanced telecommunications, information, and multimedia technologies" (Boyer et al., 2002, p. 175); the definition implicitly includes the idea of multiple channels through which services are delivered. We, therefore, define the perceived quality of channel integration as the extent to which customers perceive seamless experiences across mobile and web channels (Payne et al., 2004; Sousa and Voss, 2006).

Researchers have concluded that poorly integrated channels may result in customer dissatisfaction and

loss of customers (Sousa and Voss, 2006). Conversely, offering well-integrated multiple channels as means to satisfy customer needs leads to increased customer satisfaction (Wallace et al., 2004). To verify these relationships where channel integration quality affects customer satisfaction in CCEC, we intend to test the following hypothesis:

H1: In cross-channel electronic commerce, the perceived quality of channel integration is positively associated with overall satisfaction with the retailer.

3.3. The Influences of Mobile Channel Configurations

As mobile applications proliferate, integrating mobile channels with existing marketing and sales channels lead to new opportunities and challenges for retailers. In mobile channels, small screen size, limited processing power, and lack of integration protocol support are significant challenges for retailers (Adipat et al., 2011). Several advantages also exist for mobile channels including comfort, spontaneity and mobility, each of which facilitates customers' access to firms' products and services (Buellington et al., 2004). Similarly, success factors for e-commerce with mobile channels include accessibility, real-time access and updates, and integration with existing channels (Sheng et al., 2005). With these opportunities and challenges, we focus on two salient factors that may have an impact on channel integration quality in CCEC environments: functionality- and interactivity-oriented configurations. Since channel integration is important for customers to access the same data on mobile devices as well as on websites, in print media, or in physical stores, well-functionally and interactively configured mobile channels may increase firms' values in CCEC contexts.

3.3.1. Functionality-oriented Configuration of Mobile Channel

The Functionality-oriented configuration of mobile channels is defined as the extent to which customers perceive the quality of functions or functional components offered through mobile channels associated with their respective websites. In this study, we explain functional extensibility and functional complementarity as potential indicators of the functionality-oriented configuration of mobile channels.

First, mobile channels are typically designed to provide core functions used in websites. Simultaneously, they can be applied by different mobile networking technologies such as location management, multi-cast support, network dependability, support for quality-of-service, and the ability to roam across multiple wireless networks. Location-based service is a subset of location management and critical for mobile applications utilizing global positioning system (GPS) technology; multi-cast support refers to transactions from multiple users under mobility; and network dependability concerns user access, which makes multiple network availability. For example, Amazon.com provides book information and orders on its website as well as through its mobile application (i.e., Amazon mobile app). Offering the process of delivering the book based on location management technology in the Amazon mobile app can be called a type of functional extensibility. Moreover, applications of near-field communication (NFC), Bluetooth, and speech recognition technology in mobile devices offer new avenues for growth and new opportunities in e-commerce environments. The newly added technologies on mobile channels contribute to a function of the mobile application and result in better customer service by creating synergies (Park et al., 2014; Rosenbloom, 2007). Therefore, functional extensibility

refers to how much mobile channels are extended through the addition of new functionality; it encourages customers to use mobile devices in addition to websites. As such, we hypothesize the relationship between mobile channels and its perceptions of integration as:

H2a: In cross-channel electronic commerce, the functional extensibility of mobile channels is positively associated with perceived quality of channel integration.

Functional complementarity refers to the extent to which the basic functionality and essential features of the mobile channels support customers' e-commerce activities on websites (Mithas et al., 2007). Complementary functions enable customers to complete their intended activities in cross-channel commerce, which is important to ensure superior customer experiences (Mithas et al., 2007). In other words, with functional complementarity, customers can accomplish preferred tasks through mobile channels. As an example of functional complementarity, United Parcel Service (UPS), a global package delivery company in the USA, provides the location-tracking features (e.g., location accuracy, location frequency at response time, etc.) on both a mobile application and a website. In the similar way, the processes such as online ticketing services and flight and hotel reservations can be performed on mobile applications (Buellingen et al., 2004); these mobile applications support customers' activities occurring on websites. Because customers are already familiar with retailers' services through web channels, retailers attempt to integrate new channels (i.e., mobile channels) with their extant channels (i.e., websites). Therefore, we propose that functional complementarity enhances customers' perceived quality of channel integration in CCEC:

H2b: In cross-channel electronic commerce, the functional complementarity of the mobile channels is positively associated with perceived quality of channel integration.

3.3.2. Interactivity Configuration of Mobile Channel

Perceived interactivity is defined as the extent to which people perceive their experiences as simulations of interpersonal interactions and sense they are in the presence of a social other (Thorson et al., 2006; Zhao et al., 2012). By adopting the definition in this study, the interactivity of mobile channels can be conceptualized as the extent to which customers perceive consistency across channels, particularly between mobile channels and websites (Sousa and Voss, 2006). Such interactivity of mobile channels has been considered a salient belief for improving channel effectiveness in cross-channel settings (Jung and Hong, 2014; Montoya-Weiss et al., 2003). In the study, the interactivity of mobile channels has two dimensions: information consistency and visual consistency.

Information consistency refers to the consistency between information exchanged with customers through different channels, including both outgoing and incoming information (Montoya-Weiss et al., 2003; Sousa and Voss, 2006). Inconsistent information across channels confuses customers and reduces their trust toward retailers because customers cognitively expect that information found when using mobile channels be at least similar information found when using other channels. In this respect, retailers provide integrated and consistent customer experiences across all channels, ensuring a coherent message with all information conveyed by different channels (Payne et al., 2004). For instance, customers may

have positive or negative expectations about applications by searching the application through a different channel, such as the Web. Therefore, Google must consistently update the information available anywhere and anytime. In sum, information consistency of mobile channels affects customers' perceived quality of channel integration in CCEC:

H3a: In cross-channel electronic commerce, the information consistency of the mobile channels is positively associated with perceived quality of channel integration.

Visual consistency refers to the consistency of the relevant and comparable visual attributes including visual aesthetics, image, font, order, or complexity in mobile channels associated with retailers' websites (Sousa and Voss, 2006). Prior studies noted that the interactivity of mobile channels plays a critical role in enhancing customers' seamless experiences across multiple channels (Ganesh, 2004; Sousa and Voss, 2006). Design can be a challenge because retailers need to understand and focus users' needs; however, when mobile channels are designed and operated by similar usability methods as websites, customers are provided with familiarity. Therefore, mobile channels need to include easy navigation, usability, and attractive appearance. Even though each mobile platform has its own way to present its language, design, and tools for convenience, customers would like to use the familiar versions of the designs represented on their respective websites. Therefore, we propose that visual consistency of mobile channels enhances customers' perceived quality of channel integration in CCEC:

H3b: In cross-channel electronic commerce, visual consistency of the mobile channels is positively

associated with perceived quality of channel integration.

3.4. Control Variables

The control variables we selected account for the differences among individuals or situations. These variables include website and mobile channel quality. We selected these variables because of their potential impacts on CCEC as well as on the overall satisfaction with retailers as suggested in extant research.

IV. Research Methodology

4.1. Instrument Development

This study adopted existing measures in the relevant literature for our survey instrument; they had

repeatedly been tested with strong content validity. We also adapted them to our research domain. Before testing our proposed research model shown in <Figure 1>, we conducted a pilot test for our survey. The pilot study aimed to identify potential problems with the instrument's wording, content, format, and procedures. Eighty-seven users were included in the pilot study. The results of the pilot study encouraged us to slightly modify the survey instrument for clarity. The survey instrument can be found in <Table 1> All items used a 7-point Likert scale.

4.2. Sample and Data

The purpose of this study is to examine the relationships of functionality- and interactivity-oriented configurations of mobile channels, customers' perceived quality of channel integration, and customers' overall satisfaction with retailers. Before testing the relation-

<Table 1> Measurement, Mean, Standard Deviation, and Factor Loadings

Construct	Indicators	Mean	Std.	Loadings
Functional Extensibility (FE)	FE1. The mobile app offers unique functions not provided in the website.	5.05	1.31	0.889
	FE2. In the mobile app, I think I can do something unavailable in the website.	4.99	1.27	0.919
	FE3. The functional extension provided in the mobile app is helpful.	4.99	1.21	0.920
Functional Complementarity (FC)	FC1. I can easily navigate the mobile app using a similar way of navigating the website.	4.76	1.42	0.968
	FC2. When I use the mobile app, I can use most functions available in the website.	4.76	1.34	0.959
Information Consistency (IC)	IC1. The information I get from the website is consistent with the mobile app.	4.78	1.34	0.917
	IC2. The mobile app consistently presents the information used in the website.	4.96	1.29	0.921
	IC3. In the information aspect, the mobile app is compatible with the website.	4.85	1.30	0.944
Visual Consistency (VC)	VC1. The mobile app visually looks compatible with the website.	4.92	1.28	0.943
	VC2. The mobile app is visually consistent with the website.	4.72	1.26	0.932
	VC3. In the visual aspect, the mobile app is compatible with the website.	4.83	1.30	0.945

<Table 1> Measurement, Mean, Standard Deviation, and Factor Loadings (Cont.)

Construct	Indicators	Mean	Std.	Loadings
Perceived Quality of Channel Integration (PIQ)	PIQ1. Two channels, the mobile app and website, are well integrated each other.	4.91	1.26	0.914
	PIQ2. The retailer well combines its service across the website and the mobile app.	4.79	1.15	0.909
	PIQ3. I perceive a consistent experience across two channels, the website and mobile app.	4.72	1.27	0.876
Overall Satisfaction with Retailer (OS)	OS1. All things considered, I will definitely recommend the retailer to my friends.	4.46	1.27	0.894
	OS2. Overall, I am very satisfied with the retailer.	4.95	1.05	0.860
Website Quality (WQ)	WQ1. I am very pleased with the website I visited.	4.41	1.13	0.911
	WQ2. I am very delighted with the website I visited.	4.65	1.10	0.915
	WQ3. All things considered, I would rate the website as being of high quality.	4.49	1.24	0.882
Mobile Channel Quality (MQ)	MQ1. I am very delighted with the mobile channel I visited.	4.72	1.26	0.878
	MQ2. All things considered, I would rate the mobile channel as being of high quality.	4.49	1.24	0.900
	MQ3. Overall, I think the quality of mobile channel is good.	4.66	1.23	0.888

ships proposed in <Figure 1>, we first pilot tested our survey to identify potential problems with the instrument’s wording, content, format, and procedures. For this pilot study, we selected twenty-nine undergraduate and graduate students at a large university in South Korea. Of the 29 voluntary participants, 52.7 percent were male, and 47.3 percent were female. Based on the results of the pilot study, minor modifications were made to the survey items to make them clearer and more straightforward; this modified survey questionnaire was used for the main study.

For our main study, participants currently using both personal computers and smartphones to perform e-commerce activities (e.g., product searches, purchases) were eligible. Asking participants about their current usage and experience of using websites and mobile channels provided by e-commerce retailers (e.g., G-market, 11st), we finalized the sampling frame to consist of 217 participants who were drawn from among undergraduate and graduate students at a large university as well as among working

professionals in firms in South Korea. Our sampling frame was not collected from specific websites or mobile channels; rather, participants in this study reported the websites and/or mobile channels they frequently visited. <Table 2> shows the demographic information of participants.

4.3. Measurement Scale Validation

Partial Least Squares (PLS) was used for the data analysis. PLS makes fewer demands compared to covariance-based approaches, such as distributions, sample sizes, and measurement scales (Chin, 1998). Specifically, because the nature of this study is more focused on exploratory aspects, we relied more on the predicted variance of salient beliefs of customers’ overall satisfaction with retailers rather than goodness of fit between model parameters and observed correlations.

We assessed the validity and reliability of the reflective measures in multiple ways. We tested to en-

<Table 2> Demographic Information of Participants

Characteristics	Frequency (N = 271)
Gender	
Male	111 (51.6%)
Female	106 (48.4%)
Age	
20s	104 (47.9%)
30s	72 (33.2%)
40s	35 (16.1%)
Over 50s	6 (2.8%)
Education	
Undergraduate Coursework	80 (36.9%)
Bachelor's Degree	110 (50.7%)
Graduate Coursework	22 (10.1%)
Graduate Degree	5 (2.3%)

sure the constructs had sufficient psychometric validity. To ensure the stability of the model for testing the research hypotheses, the PLS bootstrap resampling procedure with an iteration of 1,000 sub-samples drawn with replacement from the initial sample to generate percentile bootstrap *p*-values was used. To assess convergent validity, we evaluated Cronbach's α and factor loadings; for exploratory research, the values reached above the required thresholds of 0.7 and 0.5, respectively (Fornell et al., 1981; Nunally, 1978) (see <Table 1> for the

values of factor loadings). The composite reliability was assessed using internal consistency scores, calculated by the composite reliability scores. The values of composite reliability were also above the required threshold of 0.7 (Nunally, 1978). The square root of each construct's average variance extracted (AVE) is larger than its correlations with other constructs by reaching the required threshold of 0.5 (Nunally, 1978). <Table 3> shows the summary of the validity and reliability as well as inter-construct correlations.

<Table 3> Reliability and Construct Correlations

Construct	Cronbach's α	Composite Reliability	Inter-Constructs Correlations*							
			FE	FC	IC	VC	PIQ	OS	WQ	MQ
Functional Extensibility (FE)	0.896	0.935	0.909							
Functional Complementarity (FC)	0.923	0.963	0.520	0.963						
Information Consistency (IC)	0.918	0.948	0.631	0.406	0.927					
Visual Consistency (VC)	0.934	0.958	0.638	0.423	0.713	0.940				
Perceived Quality of Channel Integration (PIQ)	0.884	0.927	0.632	0.473	0.698	0.782	0.900			
Overall Satisfaction with Retailer (OS)	0.701	0.870	0.459	0.414	0.503	0.464	0.451	0.877		
Website Quality (WQ)	0.887	0.930	0.459	0.369	0.515	0.468	0.492	0.629	0.903	
Mobile Channel Quality (MQ)	0.865	0.918	0.594	0.532	0.556	0.502	0.536	0.609	0.501	0.888

Note: The diagonal elements (in bold) represent the square root of the AVE.

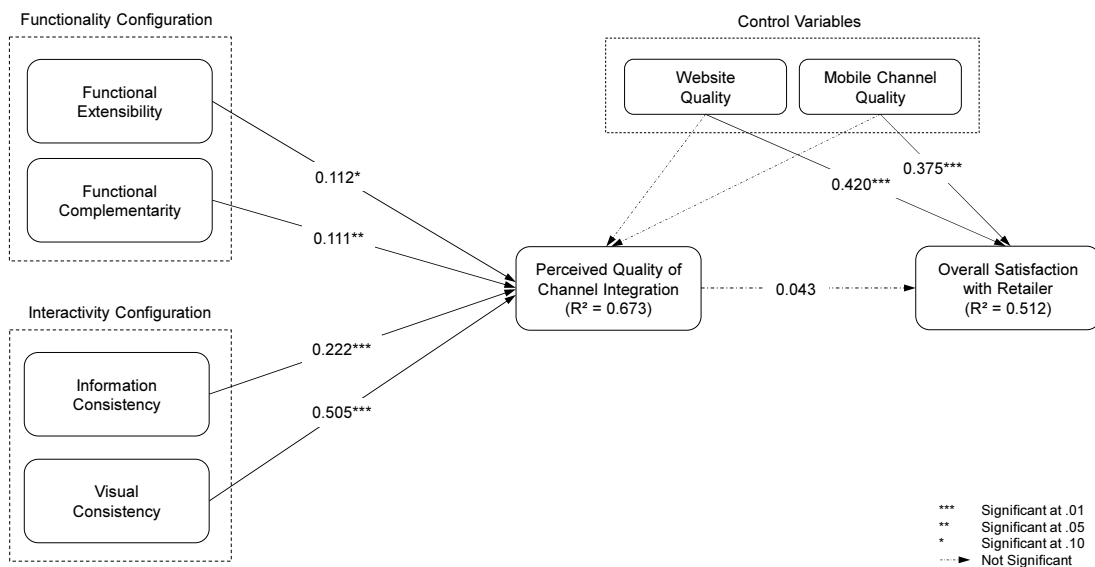
4.4. Common Method Bias

Common method bias is “variance that is attributable to the measurement method rather than to the constructs the measures represent” (p. 879) (Podsakoff et al., 2003). To test the common method bias, we conducted the unmeasured latent method construct (ULMC) approach introduced by Liang et al. (2007). <Appendix A> displays the results of common method bias analysis including constructs, the substantive factor loadings, and the method factor loadings. The results reveal that only 6 (out of 16) of the method factor loadings were statistically significant. The results also demonstrate that the variances of the indicators (average of 0.847) are substantially greater than their method-based variances (average of 0.020). Given these results, we assert that the method is not a serious concern for this study.

4.5. Results

In a PLS structural model, loadings of measures of each construct can be interpreted as loadings in a principal components factor analysis. Paths are interpreted as standardized beta weights in a regression analysis. The PLS path coefficients are shown in <Figure 2>, <Figure 2> presents the estimates obtained from PLS analysis including the statistically significant control variables. The relationships of website and mobile channel quality only on overall satisfaction with retailers were considered in the structural model by affecting path weights among the major constructs in the model.

The first hypothesis (H1), which asserts that customers’ perceived quality of channel integration is positively related to their overall satisfaction with retailers, is not supported by the PLS results ($\beta = 0.043$, t -value = 0.776). With website and mobile channel quality, channel integration quality accounts for 51.2 percent of the variance in customers’ overall



<Figure 2> PLS Results

satisfaction with retailers; however, despite the relatively high R^2 value ($R^2 = 0.512$), our results show that perceived quality of channel integration does not influence overall satisfaction with retailers.

H2a, the relationship between functional extensibility and customers' perceived quality of channel integration, is marginally supported at $p < 0.10$ ($\beta = 0.112$, t -value = 1.775); H2b, the relationship between functional complementarity and customers' perceived quality of channel integration, is supported at $p < 0.05$ ($\beta = 0.111$, t -value = 2.061). Therefore, H2a and H2b are supported.

H3a and H3b, interactivity-oriented configurations (information and visual consistency) of mobile channels are positively associated with customers' perceived quality of channel integration, are supported at $p < 0.01$, both ($\beta = 0.222$, t -value = 2.853; $\beta = 0.505$, t -value = 6.741). Therefore, H2c and H2d are all supported in this study. In addition, the high R^2 value ($R^2 = 0.673$) of perceived quality of channel integration indicates that functionality- and interactivity-oriented configurations of mobile channels explained a large amount of variance in customers' channel integration quality in CCEC environments.

V. DISCUSSION

This study aims to develop a framework for effectively constructing cross-channel electronic commerce (CCEC) environments by fostering a seamless customer experience. For this, we set out to propose that customers' perceived quality of channel integration can be determined by the functionality- and interactivity-oriented configurations of the mobile channels, which, in turn, enhances customers' overall satisfaction with retailers. Our findings and insights are explained as follows.

First, we regarded customers' perceived quality of channel integration as a proxy of their seamless experiences across channels and hypothesized that channel integration quality influences customers' overall satisfaction with retailers (H1). However, the results of our PLS analysis showed that channel integration quality has no significant impact on overall satisfaction with retailers. This finding implies that seamless customer experiences may not directly enhance customers' overall satisfaction toward retailers; rather, we infer that it may indirectly influence the overall satisfaction along with company with their perceived quality of media such as websites and mobile applications. Hence, unlike our argument in this study, we alternatively propose that website and mobile channel quality fully mediates the impacts of seamless customer experiences (i.e., channel integration quality) on overall satisfaction toward retailers.

Second, exploring the factors for fostering a seamless customer experience, we emphasized the roles of functionality-oriented (H2) and interactivity-oriented (H3) configurations of mobile channels in CCEC. The PLS results showed that all factors we considered (i.e., functional extensibility and complementarity, information and visual consistency) positively affect customers' perceived quality of channel integration. In addition, the high R^2 value ($R^2 = 0.673$) implies that mobile channel configurations can be main drivers for improving seamless customer experiences in CCEC. We also found that, among significant drivers of channel integration quality, visually consistent mobile channels (with a higher path coefficient value, $\beta = 0.505$) play a critical role for customers to perceive the higher quality of channel integration, which let them feel seamless experiences across channels.

5.1. Theoretical Implications

This study demonstrates theoretical implications. First, prior research on cross-channels has focused on the relationships between online and offline channels (Montoya-Weiss et al., 2003; Sousa and Voss, 2006; Yang et al., 2013). Drawing on brand extension theory, which has not been widely used in the IS field, this study extends the online-offline channel effects to the relationships between multiple online channels along with the popularity of mobile technologies. Particularly, this study concerns the degree of seamlessness that customers experience across channels by conceptualizing it as channel integration quality.

Second, we investigate the salient factors that develop customers' seamless experiences across online channels. More specifically, we shed light on the role of mobile channels in enriching customers' seamless experiences by considering mobile channel configurations (functionality- and interactivity-oriented configurations) as salient factors for channel integration quality. In sum, this study theoretically contributes to develop a research framework identifying the role of mobile channels as an extension of existing websites in CCEC.

Third, the design issues of mobile applications have attracted a lot of attention in Human-Computer Interaction (HCI) research. Previous studies argued that, due to mobile devices' unique constraints such as small screens and different functionalities, the interface of mobile applications should be designed differently and carefully (Jung and Hong, 2014). In line with this, our findings show that functionality and interactivity can be two critical factors in mobile application design. Hence, this study complements previous HCI research by identifying key factors in designing mobile channels.

5.2. Practical Implications

This study provides practical insights for effectively articulating e-commerce strategy for firms when firms incorporate the mobile-based online market with existing online markets. Moreover, beyond the service quality across offline to online channels, this study suggests configurable characteristics of mobile channels in order to offer consistent and seamless customer experiences; it helps firms to set up their mobile IT strategy and developments in CCEC.

5.3. Limitations and Future Research

There are limitations to this study, which warrant discussion. First, we focused on the mobile channel configurations as salient factors for enhancing channel integration quality; in this study, the configurations properly accounted for channel integration quality. Nonetheless, it is possible that there are other attitudinal, emotional, and cognitive factors facilitating seamless customer experiences. Therefore, we encourage further research, which includes other possible antecedents in the context of CCEC.

Second, in this study, we considered website and mobile channel quality as control variables on overall satisfaction with retailers. Rather, as we discussed earlier, a channel medium could be a mediator of the relationships between channel integration quality and overall satisfaction. Hence, we encourage researchers to investigate the active roles (as direct antecedents or mediators) of website and mobile channel quality in CCEC associating with channel integration quality.

Third, this study regarded channel integration quality as a proxy of seamless customer experiences in CCEC. In this study, channel integration quality seems to be an appropriate proxy to measure seamless

customer experiences; however, from our result that channel integration quality does not significantly influence overall satisfaction with retailers, we surmise that our proxy may be limited in elucidating seamless

customer experiences. Therefore, we encourage researchers to develop a more robust measurement of seamless customer experiences in CCEC.

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<Appendix A> Common Method Bias Analysis

Construct	Indicator	Substantive Factor Loading (R1)	R1 ²	Method Factor Loading (R2)	R2 ²
Functional Extensibility (FE)	FE1	0.887**	0.787	0.037	0.001
	FE2	0.928**	0.861	-0.183**	0.033
	FE3	0.914**	0.835	0.142**	0.020
Functional Complementarity (FC)	FC1	0.964**	0.929	0.025	0.001
	FC2	0.963**	0.927	-0.026	0.001
Information Consistency (IC)	IC1	0.913**	0.834	0.082	0.007
	IC2	0.925**	0.856	-0.085*	0.007
	IC3	0.944**	0.891	0.002	0.000
Visual Consistency (VC)	VC1	0.944**	0.891	-0.027	0.001
	VC2	0.934**	0.872	-0.073	0.005
	VC3	0.942**	0.887	0.098*	0.010
Perceived Quality of Channel Integration (PIQ)	PIQ1	0.906**	0.821	0.338**	0.114
	PIQ2	0.910**	0.828	-0.048	0.002
	PIQ3	0.886**	0.785	-0.347**	0.120
Overall Satisfaction with Retailer (OS)	OS1	0.877**	0.769	-0.016	0.000
	OS2	0.878**	0.771	0.016	0.000
Average		0.920	0.847	-0.004	0.020

Note: ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$

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