

# Human-Computer vs. Consumer-Store Interaction in a Multichannel Retail Environment: Some Multidisciplinary Research Directions

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**Abstract.** The increasing availability of electronic applications in physical retail stores has created a series of interesting research opportunities with challenging managerial implications for practitioners. Since the graphical user interface design constitutes a critical user-consumer influencing factor in the context of a multichannel retailing environment, there are several multidisciplinary research initiatives that could add value towards an integrated investigation of this topic. To this end, the paper discusses the promising role of combining Information Systems and Marketing disciplines for conducting behavioural studies in the context of multichannel/omnichannel retailing, approaching humans both as users of information systems and consumers of retail stores. Similarly, the paper treats the screen of the electronic applications available in online and offline retail stores both as a graphical user interface of an information system and as the atmosphere/servicescape of a retail store. The paper provides several future research directions and practical implications for this fast evolving topic.

**Keywords:** HCI, Consumer Behaviour, Multichannel Retailing, Omnichannel Retailing, Multidisciplinary Research.

## 1 Introduction

Since the emergence of the WWW, the Graphical User Interface (GUI) design of a web site also serves as the retail storefront for selling products and services. Humans interacting with web-based retail stores are both users of information systems and consumers visiting online stores.

Nowadays, consumers interact with multiple channels (touchpoints) throughout their shopping journey. In some cases, they even interact with multiple channels simultaneously. This type of multichannel retailing has been characterized as omnichannel (“omni” means all, universal in Latin) (Brynjolfsson & Rahman, 2013, Rosenblum & Kilcourse, 2013). According to Ortis (2010), omnichannel retailing refers to the simultaneous use of all the available business-to-consumer channels, while multichannel retailing refers to the use of each of these channels in parallel (i.e. not at the same time). Similarly, Ortis and Casoli (2009) report that omnishoppers use

available retail channels (e.g. offline and online) at the same time (e.g. use of smart phones in the physical store for price comparison in order to negotiate prices with the physical store's sellers).

The evolution of multichannel in the form of "omnichannel" retailing along with the employment of Information and Communication Technologies (ICT) applications with innovative user interfaces (e.g. ubiquitous mobile devices, new technologies in physical stores (Pinel 2005), etc.) create several corresponding research challenges in the alternative retail channels (e.g. call centers, physical stores, mobile ecosystems, social media, etc.). As a result, HCI in an omnichannel retailing environment translates to Mobile Commerce and Pervasive Computing HCI concepts. Omnichannel concepts are not new (Roussos et al. 2003, Kourouthanassis et al. 2007), but now it is the first time they appear so often in practice, since enabling technologies are widely available and consumers are familiar with them. Indicatively, in a recent report (Wurmser, 2014) it was found that 80% of US mobile Wi-Fi users use their mobile devices while shopping in-store.

Furthermore, as presented by Dijk, Laing, & Minocha (2005), multichannel interaction is found to be complex and dynamic: consumers switch between channels in order to achieve the best deals and support, throughout the shopping process. For example, users-consumers could visit the GUI design of a web-based retail store to search and evaluate alternative products and services (decide online) and then they could visit the physical store to buy the desired products or services by using (or not) the available interfaces of the information systems applications that are available in the store. Conversely, users-consumers could visit the physical store to inspect products (i.e. decide offline) and then they could conduct their purchases online through a web site that offers their desired product at the lowest price. However, it should be noted that with the use of mobile phones, this activity can take place while in-store and/or in physical commercial environments (e.g. while walking in a commercial street) and, thus, another GUI plays an important part in the process. In the second of the aforementioned scenarios (i.e. decide offline and buy online), the physical store operates as a "showroom" and, thus, retailers should consider how to face this emerging consumer behavioural practice, also called "free-riding behaviour" (Van Baal, S., & Dach, C., 2005, Chiu et al. 2011).

Moreover, retailers have to deal with multichannel integration and coordination, both at the frontend (e.g. responsive design) and at the backend (e.g. online and offline data integration) of their operations. In other words, their physical and electronic touchpoints must be aligned with their multichannel strategies, in order to provide consumers with a unified shopping experience at all times.

Thus, while on the one hand the rapid diffusion and adoption of multichannel/omnichannel user-consumer practices increases the complexity of relevant research initiatives, it creates several attractive research and business opportunities that deal with several aspects of this emerging user-consumer behavioural pattern (e.g. interface design, integrated marketing communications, decision-making, etc.) on the other.

Elaborating on these evolutions, the present paper aims at documenting the need to adopt multidisciplinary research approaches when investigating humans' behaviour in the context of multichannel/omnichannel retailing and provide a series of corresponding calls for further research in this area. In other words, the objective of the paper is to justify the research needs and challenges in this fast evolving landscape as well encourage and guide corresponding further research initiatives.

The paper is structured as follows. After the Introductory section, section 2 briefly presents some indicative business dynamics and available research insights in this topic. Then, section 3 includes the research calls and propositions derived through the present research attempt as well as some practical implications.

## 2 Business Dynamics and Indicative Research Insights

The importance of today's multichannel research initiatives is emphasized by several recent calls for papers in the academic community (Verhoef, P., et al. (2013), Palmatier, et al. (2013), Grewal D., et al. (2013), Yang K (2013)).

On the other hand, several multichannel business and IT initiatives have recently emerged, such as:

Launch of the Universal Analytics platform by Google, which merges both online and offline data, providing valuable feedback for research in this field.

Mobile apps that support the in-store purchase process (e.g. Apple Store App<sup>1</sup>, Shopbeacon<sup>2</sup>).

In-store technologies supporting the purchase process (e.g. iBeacon, camera face-recognition<sup>3</sup>).

New software platforms that aim to merge online & offline operations (e.g. Index<sup>4</sup>, Euclidanalytics<sup>5</sup>, Retailnext<sup>6</sup>).

Existing research, however, has not adequately investigated this topic by employing multidisciplinary and multichannel research approaches. Usually, customer interfaces are examined separately and not in parallel or simultaneously (Burke, 2002).

Indicatively, in mobile HCI literature it has been found that visual design aesthetics significantly impact perceived usefulness, ease of use, enjoyment and ultimately users' loyalty intentions towards a mobile service (Cyr, D. et al. 2006). Nevertheless, this study was solely single-channel.

In another study close to the omnichannel concept, Jan-Willem et al. (2010) examined the role of mobile recommendation agents in the shopping process. They found that the perceived usefulness variable was much more important than the ease of use one, as it influenced product purchases and predicted usage intentions and store preferences of consumers. However, it should be noted that the mobile devices and interfaces employed by the study were used only for experimental purposes instead of real shopping situations.

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<sup>1</sup> <http://news.yahoo.com/apple-guides-shoppers-inside-stores-ibeacon-082910193--finance.html>

<sup>2</sup> <http://www.shopkick.com/shopbeacon>

<sup>3</sup> <http://www.brickstream.com/products/brickstream-devices/>

<sup>4</sup> <http://www.index.com/technology>

<sup>5</sup> <http://euclidanalytics.com/product/technology/>

<sup>6</sup> <http://www.retailnext.net/analytics-technology>

Also, Xu et al. (2008, p.401) explored the emerging patterns of how users switch their attention between the physical and the digital world. They revealed that “mobile interface design needs to allow the flexibility of interaction process” and that “connecting the mobile tasks with real world intentions need to be considered in the design”.

Another important aspect of mobile HCI is presented by Bellman et al. (2011) study, the one of mobile apps. They found that apps with an informational/user-centered style were more effective at shifting purchase intention and creating brand awareness. Nevertheless, since omnichannel mobile apps have been only recently launched, their role (as part of the multichannel/omnichannel experience) through a mobile HCI research perspective remains unexplored.

Moreover, Yang & Kim (2012, p.786) found out that “mobile shopping services/applications need to be designed and positioned with various consumer motivations in using a new shopping channel”. Finally, responsive design as a means of implementing universal HCI across multiple devices draws significant attention in research studies (e.g. Mohorovicic 2013).

On the other hand, in pervasive retailing IS literature there is evidence that in-store shopping experience can be greatly enhanced by utilizing supportive HCI interfaces in the form of tablets that assist shopping carts (Kourouthanassis et al. 2007). Longo et al. (2013) recently introduced an approach of innovative in-store experience applications leveraging the Internet of Things, HTML5 and Pervasive Display Networks. Lastly, Pantano (2013) reports that research has focused on the identification and development of new applications for pervasive retailing and that its concepts will significantly affect searching for goods, payment modalities and shopping atmosphere.

Table 1 presents some indicative Omnichannel HCI touchpoints that the User/Consumer interacts with, both physically and electronically, according to the location he/she is situated in a retail setting.

**Table 1.** Indicative Omnichannel HCI Touchpoints

<b>Location</b>	<b>Physical Touchpoint</b>	<b>Electronic Touchpoint</b>
Mobile	Phone Call	Mobile Channels (Web, Apps, Social)
Wearable	Physical Senses	Wearable Computing (e.g. Google Glass)
Product	Packaging	RFID, QR Code, etc.
Store Environment	Catalogs	Info Kiosks, Pervasive Displays
	Cashier	Electronic Checkout (e.g. NFC, iBeacon)
	Dressing Room	Virtual Dressing Room
	Physical Entry	Visibility Login (e.g. camera monitoring)
	Shopping Cart	Electronic Cart (e.g. featuring RFID readers, electronic displays)

Indicatively, the diffusion of digital interfaces in physical retail settings like info kiosks, QR codes, barcode/RFID readers, iBeacon/BLE, NFC, augmented reality (e.g. Google Glass), etc. calls for the combined use of the Marketing (e.g. Retailing, Consumer Behaviour) and the Information Systems disciplines (e.g. Human Computer

Interaction, User Behaviour) towards investigating humans' behaviour in these business settings through an integrated and robust manner. Along these lines, Benou et al. (2012) underline the need to adopt multidisciplinary research approaches in user-consumer behavioural studies in the context of mobile commerce. Specifically, they call for a combined use of Information Systems and Marketing disciplines when studying humans' behaviour in this context.

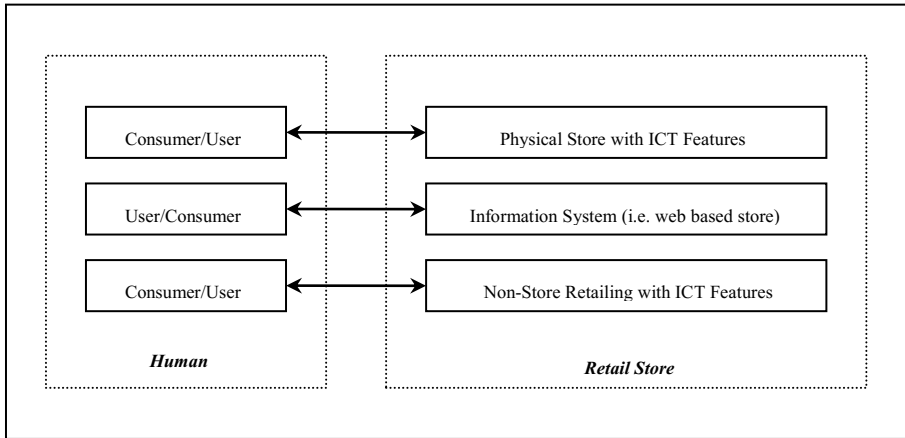
In this manner, the GUI of a web store constitutes at the same time the virtual retail store Atmosphere of this store (Vrechopoulos, 2010). Therefore, while the GUI approach is positioned in the Information Systems domain, the Store Atmosphere approach is positioned in the Marketing one, since it is related with one of the 7Ps of the services marketing mix (physical evidence) called *servicescape* for services' retail contexts (see Bitner 1992, Zeithaml et al. 2006). It is evident that an Omnichannel Retail Store Atmosphere (ORSA) includes both similarities and differences when compared to the atmosphere of a conventional retail store. Therefore, an interesting insight would be to identify these differences and investigate how consumer behaviour is affected by them.

Also, research could be conducted in order to clarify how consumers handle the complexity of the increased number of retail channels and how they interact across multiple touchpoints and GUIs in relation to the conventional consumer purchase decision model (Peter et al., 1996).

In parallel, moving towards the Information Systems backend, several research attempts investigated the relationship of Customer Relationship Management Information Systems and multichannel environments (Görsch 2002, Payne & Frow 2004, Sinisalo 2011, Verhoef et al. 2010 and Atapattu & Sedera 2012). CRM integration with E-Commerce platforms and technologies is crucial for merging online & offline data towards providing a seamless unified experience to consumers, as well as multichannel analytics to retailers. Indicatively, a key concept of omnichannel retailing is the electronic customer login in the physical store, which requires deep Information Systems integration of all platforms and the appropriate HCI interfaces to accompany them (Ganesh, 2004, Ganesh, Padmabhun, & Moitra, 2004).

In sum, Human Computer Interaction, Mobile & Pervasive Computing, Customer Relationship Management Information Systems, are some indicative topics under the umbrella of the Information Systems domain that could add value to such research initiatives. Similarly, the Marketing discipline could contribute towards the execution of such research attempts through the active involvement of the Consumer Behaviour, Retail Management, Marketing Research, Services Management, Relationship Marketing, etc. topics.

Figure 1 diagrammatically depicts the roles and options in humans-retail store interaction process in the context of multichannel and omnichannel retailing. It should be clarified that non-store retailing refers to both traditional retail channels (e.g. door-to-door selling, vending machine retailing, catalogue retailing, telephone selling, etc.) and new ones (e.g. e-mail, CRM-enabled call centers, etc.). However, also the traditional non-store retailing category could potentially include several Information and Communication Technologies (ICT) features (e.g. QR codes-enabled interactive printed catalogues, advanced ICT options in vending machine retailing, ICT supported door-to-door personal selling through smart personal devices with Internet access carried by salesman, etc.).



**Fig. 1.** Roles and Options in Humans-Retail Stores Interaction Process

### 3 Research Calls, Propositions and Practical Implications

While user and consumer behavioural studies have thoroughly investigated humans' behaviour in the context of online and offline retailing until today, it is clear that there is still room for research designs that will investigate human behaviour in the context of multichannel and omnichannel retailing through a multidisciplinary approach (i.e. Marketing and Information Systems).

In other words, the research gap is reflected on the existence of few empirical words that have fully exploited the interdisciplinary nature and dynamics of humans' behavioural studies in the context of the fast evolving business-to-consumer "mixed" offline and online retail environment.

Thus, future research positioned in the intersection of these disciplines, could focus on measuring cause-and-effect relationships through causal research designs (e.g. experiments) in order to test whether and how the features of electronic applications (e.g. GUI, IS integration, network connectivity, responsive design, location-based services) affect user-consumer behaviour.

In other words the new directions suggested in terms of this point in order to further improve the knowledge in this field, refer to the fact that such research designs will not neglect the multidisciplinary nature of the topic and, thus, will treat the manipulated variables (i.e. treatments) as both store's and information system's features. Similarly, as far as the dependent variables of such experimental research designs are concerned, these will also follow the aforementioned logic in the sense that humans interacting with these features are at the same time users of information systems and customers of a store. Finally, a series of moderating factors that determine the effects of the manipulated variables to the dependent ones will be also approached and measured through a multidisciplinary approach (e.g. mood effects from the Marketing literature vs. telepresence effects from the Information Systems one).

Thus, the research propositions #1 and #2 are formulated as follows:

- **Research Proposition #1:** There are statistical significant differences among alternative omnichannel retail settings in terms of a series of users'-consumers' behavioural variables (e.g. perceived ease of use, perceived service quality, etc.).
- **Research Proposition #2:** The effects of omnichannel retail settings on users'-consumers' behaviour is determined by a series of moderating factors that refer to users'-consumers' demographic, behavioural and psychographic data as well as to situational ones.

Furthermore, a promising future research direction is to focus on the combination of the alternative retail channels in the context of multichannel/omnichannel retailing (see Rigby, 2011). To that end, researchers could investigate the predicting and influencing role of shopping interfaces to user-consumer behaviour by examining potential differences among various retail settings in terms of the importance users attach to the features of the employed applications' interfaces. For example, users/consumers may attach significantly more importance to the graphical user interface of a web site than the corresponding one of a smart phone device that they use within the store to compare prices, in the sense that in the second scenario they may attach more emphasis to the specific information they are seeking for (i.e. the best price) instead of the interface. Similarly, they may attach more importance to security related graphical user interface design features when they are navigating online from their home, compared to the corresponding importance they attach to this feature when they use a device offered to them by a retailer in order to effectively navigate within a physical store.

Thus, the Research Proposition #3 could be formulated as follows:

- **Research Proposition #3:** There are statistical significant differences among various retail channels in terms of the importance users/consumers attach to the graphical user interface features of the corresponding electronic applications.

Finally, another research proposition lies in the area of "showrooming" and "free-riding" behaviour (as earlier discussed in the paper) regarding the relationship of these emerging consumer behavioural patterns to the HCI touchpoints. Specifically, the open question is whether and how omnichannel HCI touchpoints in the physical stores affect such kind of behaviour. Therefore, Research Proposition #4 could be formulated as:

- **Research Proposition #4:** The integration of additional in-store HCI touchpoints that support omnichannel retailing user-consumer practices, affects free-riding behaviour and store loyalty.

Following the aforementioned discussion, researchers should focus on employing to their research designs variables that come from various disciplines and topics in a combined manner. For example, while "ease of use", "usability", "perceived usefulness", etc. are some important Human Computer Interaction variables, the "shopping motivation/orientation", "perceived service quality", "patronage intention", etc. are some important ones for the Marketing discipline. To this end, Pantano & Di Pietro (2012), after thoroughly analyzing existing TAM variables and constructs in the literature, acknowledge the development of deeper measurement scales in order to make

more detailed predictions on future consumer's behaviours regarding advanced technologies and innovation management for retailing.

Furthermore, some other interesting research topics positioned in the context of the present study could deal with the following issues:

- User-consumer co-creation of GUI (control, flow): how should the omnichannel retailing atmosphere be controlled (Vrechopoulos, 2010)?
- 3D GUI design both online and in physical retail stores (e.g. displays, infokiosks). This design could be expanded to virtual worlds & virtual reality (e.g. Second Life) as part of a multichannel strategy. An interesting aspect would be to combine virtual and physical worlds simultaneously (e.g. virtual dressing rooms in physical stores).
- Use of the online environment (due to low cost and applicability) to conduct online experiments for offline implications. However, it should be clarified that the generalizability of the results provided through such type of research designs may be limited mainly due to the important differences that exist between the offline and the online environment. Nevertheless, both practitioners and researchers have already started employing 3D technologies to execute such type of online experimental designs to test online design ideas in order to provide implications for the offline stores (e.g. store layout effects on consumer behaviour).
- "Create once, publish everywhere" approaches that are proposed by the media industry (Chorianopoulos & Lekakos, 2007). Similar to responsive design, it would be interesting to explore ways where content is seamlessly distributed across all available touchpoints, maintaining its usability while enhancing the shopping experience.

It should be also noted that since it is applicable to customize graphical user interfaces at the individual level, future research should consider whether providing "generic" (i.e. one for all) user interface design guidelines would add value. In other words, since each consumer/user is different (i.e. "segments of one" in the context of the segmentation-targeting-positioning process followed by Marketing practitioners in their Strategic Marketing Planning) retailers (ICT-enabled) could provide a personalized shopping experience also in terms of the graphical user interface design they offer to their customers (Vrechopoulos, 2010). For example, in the traditional personal selling process, experienced salesmen treat their customers through a one-to-one manner. Similarly, a graphical user interface as a "sales tool" could be potentially designed for each customer separately. However, since the issue of customization requires advanced technical skills and experience, such decisions should be taken with caution as well as should be aligned with the strategic marketing planning of the firm.

In addition to this, Ahearne & Rapp (2010, p.119) state that "the technologies that include both the salesperson and the customer offer the most intriguing areas of discovery". In omnichannel environments it would be crucial for salesmen in physical stores to use consumer-monitor interfaces that identify each customer that enters the physical store in order to assist him/her in a personalized manner. Such interfaces should provide salesmen with the full customer profile, history and needs, as well as valuable information to assist them in the selling process. Nowadays it is critical to "know what the customers want before they do" (Davenport et al. 2011). Similarly, access to multichannel universal analytics could even prevent "showrooming" and "free-riding" behaviour, since the salesman would negotiate more efficiently.



An important managerial implication derived through this discussion refers to whether and how retailers should employ additional touchpoints within their physical stores. Obviously, with the diffusion of e-commerce, maintaining a physical store would be a huge liability if it doesn't provide a competitive advantage. Thus, traditional retailers should concentrate on providing the "best of the two worlds", focusing on enhancing the shopping experience and ensuring the provision of a superior customer support. These business objectives could be potentially met by employing supportive in-store technologies and interfaces, as already encountered in this paper.

Furthermore, as also discussed in the previous sections, the GUI (either the online one or the one employed by the electronic applications available in the physical stores) could be potentially treated as one of the 7Ps of the services marketing mix. Thus, it could be accordingly adjusted within the positioning process in the context of the implementation of the strategic Marketing planning of the firm in order to build its image. Similarly, as also discussed above, personalizing or not the GUI could be a matter of strategic marketing planning in the sense that any type of such strategic and/or tactic decisions could be included in the marketing plan of the firm and could be taken having always in mind the marketing objectives that the firm has. In other words, the GUI along with the other 6 elements of the services marketing mix (i.e. price, promotion, etc.) could be manipulated in order for the company to achieve the desired positioning in the market as this is perceived by customers (perceptual positioning maps). Finally, it must be underlined that the collection, processing and exploitation of user-consumer data must always follow permission marketing guidelines and, of course, laws.

To sum up, the future research agenda for such research initiatives should not neglect the key concept of omnichannel retailing: an integrated shopping experience that melds the advantages of physical stores with the information-rich experience of online shopping (as defined by Rigby, 2011). Therefore, future multichannel HCI research should concentrate on the right blending of physical and electronic interactions, exploiting the unique characteristics of each, in order to achieve a unified shopping experience, beneficial to all participants.

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