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> * = corresponding author

If you have any questions, would like a copy of the final version of the article, or would like copies of other articles we've published, please contact any of us directly, as follows:

- **Jie "Sophia" Wei**
  - Email: lovelyyinhuli@hotmail.com
- **Stefan Seedorf**
  - Email: seedorf@synchronite.de
- ***Paul Benjamin Lowry**
  - Email: Paul.Lowry.PhD@gmail.com
  - Website: https://sites.google.com/site/professorlowrypaulbenjamin/home
  - System to request Paul's articles: https://seanacademic.qualtrics.com/SE/?SID=SV_7WCaP0V7FA0GWWx
- **Christian Thum**
  - Email: thum@synchronite.de
- **Thimo Schulze**
  - Email: thimosschulze@gmail.com

How Increased Social Presence through Co-browsing Influences User Engagement in Collaborative Online Shopping

ABSTRACT

Traditional online shopping has been a solitary activity, but technology advances are challenging this norm. Collaborative online shopping (i.e., co-shopping) stimulates more purchases than solo shopping does, and it embraces the innate human need to socialize. Thus, it represents a growing form of ecommerce and therefore draws increasing interest from researchers and practitioners. The most recent advancement in co-shopping is the emergence of social co-browsing that enables two or more users to share the same view in a browser in real time. Most existing studies on co-shopping have focused on factors that influence purchasing online, but they have not considered co-browsing. In this paper, we use social presence and engagement theories to explain the roles of co-presence and engagement in increasing endurability for co-shoppers. We tested our model with a free-simulation experiment on 234 consumers on Mechanical Turk, randomized to three conditions of co-presence. Their task involved co-browsing (except for the control condition) on an e-commerce website to shop for Apple products. To invoke the co-browsing IT artefacts, we used Synchronite as a backend to create a queue in which participants were paired in dyads. According to our results, users who perceived greater psychological presence of another shopper were significantly more engaged in the online shopping activity. In particular, co-presence in co-browsing fostered a more rewarding experience than in the chat-only condition. Finally, we outline our contributions to research and practice and discuss the limitations of this work that open up new research opportunities.

KEYWORDS

Collaboration; user engagement; social presence; co-presence; e-commerce; social presence theory; online shopping; co-browsing

1. INTRODUCTION

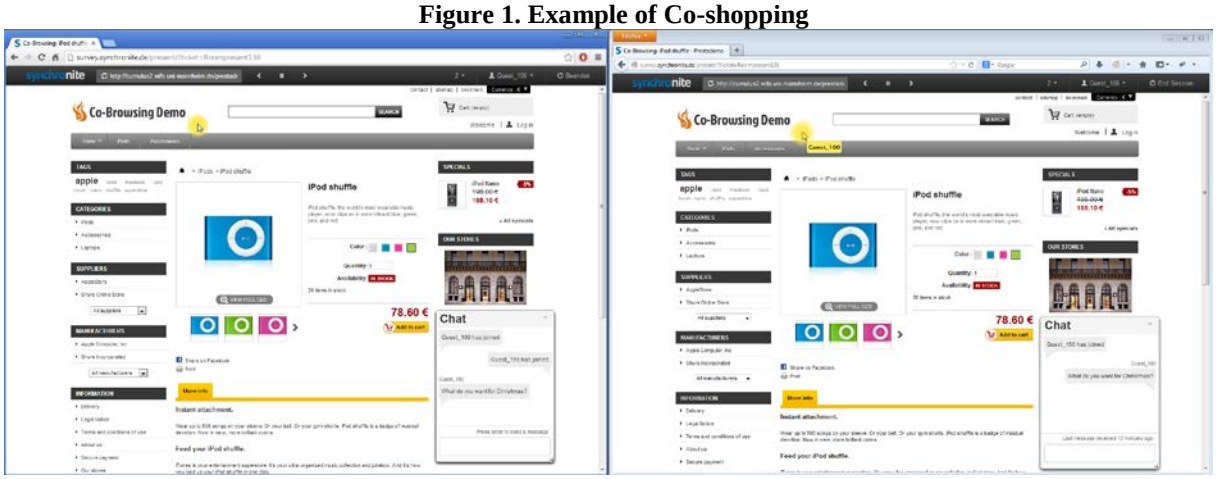
In recent years, e-commerce and online shopping markets have developed new and profitable business models due to their unique online capabilities. For example, communication services connect both people and places remotely, and people who interact with each other via Internet can be continuously connected (Attfield et al., 2011). Further, online vendors are able to exploit new possibilities that online collaboration creates, such as receiving feedback on services and products and even having customers participate in value creation (Mangold and Faulds, 2009).

Online shopping is a unique and compelling e-commerce context because shopping is an activity that naturally lends itself to social interaction, as it is something that people enjoy doing collaboratively (Goswami et al., 2007, Puglia et al., 2000, O'Hara and Perry, 2001) and is even considered part of the socialization process in most cultures (Sommer et al., 1992, Zhai and Zhang, 2014). The social foundation of shopping has led to an exciting new form of e-commerce called *collaborative online shopping*, defined as an 'activity in which a consumer shops at an online store concurrently with one or more remotely located shopping partners' (Zhu et al., 2010, p. 872). Collaborative online shopping is compelling because it uniquely fulfills social needs and because research shows that collaborative shoppers spend significantly more money than solo shoppers do (Sommer et al., 1992). Thus, collaborative online shopping is considered as 'next wave in e-commerce' (Cuevas, 2013, Yue et al., 2014).

Accordingly, leading e-retailers are rushing to incorporate collaborative and social artifacts into their websites to lure collaborative shoppers and their increased spending and loyalty. Examples from Kim et al. (2013) include eBay's 'Help Me Shop' feature; Groupon's purchase of Mertado, which helps users build their own shopping community; and similar efforts by Google and Facebook. Other retailers are getting more specific in creating website features that allow a consumer to shop with a friend in real time. We term such capabilities as *co-shopping*. An early example of this was Landsend.com's 'Shop with a Friend' tool (Zhu et al., 2010). Recently, Plurchase has released a sidebar for Amazon.com and Zappos allows consumers to engage in co-shopping with a friend (e.g., examine the same product page together, text chat) (Yue et al., 2014). Similar functions are found in TogetherJS, ShopTogether,

RocketMelt, BuddyShopping, and BevyUp (Yue et al., 2014). Figure 1 provides a co-shopping example.

Figure 1. Example of Co-shopping

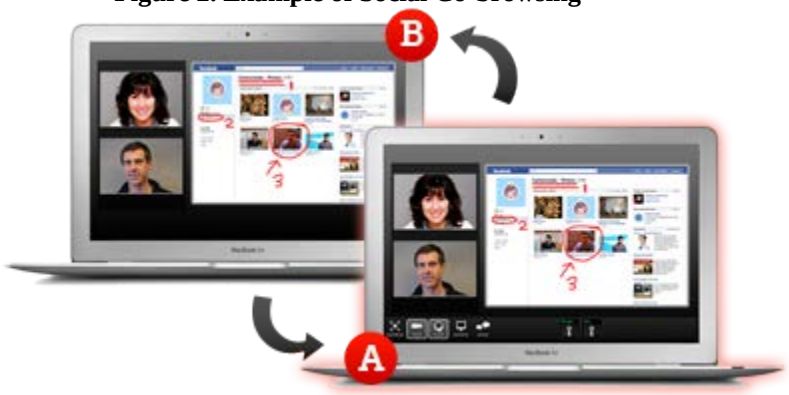


Although these industry efforts are exciting, consumer participate in such innovations only when they are willing to interact with the systems and when they find the experience engaging (O'Brien and Toms, 2010). Likewise, research has also shown the importance of rich website interaction in facilitating e-commerce (Jahng et al., 2007). Recent research has further shown that user engagement is vital to achieve participation in online communities (Ray et al., 2014, Cheung et al., 2015b). Thus, companies and designers with a vested interest in co-shopping must explore new methods to foster user engagement, and this is also important for co-shopping. The adaptation of elements such as user interface design, the organization and setup of information, social features, or instant feedback are traditional means to distinguish one's online service (Atkinson and Kydd, 1997). However, improving engagement depends on understanding and measuring the reasons, intentions, and determinants of users who actually use those services (Attfield et al., 2011, Ray et al., 2014). Our contribution to this discussion is to choose appropriate artifacts borrowed from existing theory to enhance engagement in co-shopping.

A recently conceived method of creating new online experiences that foster engagement is *social co-browsing*. This is a collaborative Web service that places real-time communication at the forefront of the user's online experience by enabling several users to share the same browsing activity in their own browsers in real time (Aneiros and Estivill-Castro, 2005). Social co-browsing is a convenient approach to effectively collaborate and carry out activities in groups (Zhu et al., 2010). Some companies are starting

to use co-browsing to support co-shopping and to increase their e-commerce success (Zhu et al., 2010, Yue and Jiang, 2013, Kim et al., 2013). Due to the novelty of this Web service, the questions regarding how to diffuse co-browsing to new users and engage them consistently are of great import. Figure 2 depicts a typical co-browsing context. The user actions are synchronized from part A (Chrome, left) to part B (Firefox, right) and vice versa. For example, when the part A user clicks on a picture in Facebook, his/her mouse movement will be displayed on part B user's screen and vice versa.

Figure 2. Example of Social Co-browsing



A technology that has been in place much longer than social co-browsing in the context of social shopping is text chat (Kim et al., 2013, Zhu et al., 2010). It constitutes the majority of the current e-retailing efforts to implement collaborative online shopping. Yet, like the newer phenomenon of social co-browsing, the effects of text chat on social shopping are largely unknown, especially in comparison with co-browsing. These are compelling technologies; however, online retailers are implementing them without further theoretical or empirical support or knowledge of how to measure the results properly. Therefore, it is vital to investigate how these technologies influence users' shopping experience. Accordingly, in this paper, we aim to answer the following research question:

> *What influences do social co-browsing and social text chat have on user engagement in the context of online shopping?*

We used a positivist approach to answer this research question. Because user engagement is a multi-stage concept comprising different attributes and theories (Kappelman, 1995, Omar and Ali, 2011, O'Brien and Toms, 2010, Ray et al., 2014), it is necessary to develop a model to measure the core

attributes of the engaging experiences of online users (and collaborative online shoppers, in our context). O'Brien and Toms (2008) thoroughly reviewed existing theories and developed a user engagement scale that is validated by empirical surveys (O'Brien and Toms, 2010). Our research thus drew on the measurement model by O'Brien and Toms (2010), to which we added the concept of co-presence. We theorized that social engagement during online shopping experience would increase consumer endurability of the online experience. An online experiment was conducted through Mechanical Turk. In the experiment, participants engaged in online shopping tasks with social co-browsing, with social text chat, or without any collaboration. Results of our data analysis suggest that users who perceived higher psychological presence of another shopper were significantly more engaged in the online shopping activity. In particular, co-presence in co-browsing enables shoppers a more rewarding experience than the chat-only approach. These and other compelling results support our model and provide pragmatic guidance on improving collaborative online shopping.

The contribution of this paper lies in that we investigate how co-presence brought by co-browsing software can improve on-line shoppers' engagement and thus increase the potential revenue of online retailers. Moreover, most related research has only focused on behavior intention to use as it only investigates solo shopping behaviors, whereas ours is on collaborative shopping. Our dependent variable is user engagement, which is not only about intention to use, but also reflects whether users think the shopping experience is worthwhile and would recommend it to others. This is much more appropriate for the collaborative shopping context. Regarding theoretical contributions, our research goes beyond a basic understanding of user engagement by measuring it through multiple constructs and adding a real-time social layer to the single user Web experience.

2. BACKGROUND

2.1 Social Co-browsing

As social co-browsing is the foundation of collaborative online shopping, we first explain its foundations. Traditionally, Web browsers have been designed for retrieving, presenting, and traversing

information resources on the World Wide Web. Importantly, the Web browsing process normally does not involve interaction between online users. However, the recent text chat applications have been added to Web browsers, extending individual use of the Web to social use. Text chat enables easy and fast communication from within any Web browser (Lowry et al., 2011). Although it is predominantly used for live support on e-commerce websites, text chat has recently emerged in collaborative online shopping to enable customers to discuss products online (Yue and Jiang, 2013, Zhu et al., 2010, Kim et al., 2013).

Co-browsing enhances real-time engagement one step further than mere chatting by extending Web browsing to the multi-user sphere. Co-browsing is a design feature that supports users to browse simultaneously, co-navigate, share the same view, or fill in online forms together (Goswami et al., 2007, Zhu et al., 2010, Kim et al., 2013). Co-browsing creates a collaborative interaction process in which remote participants can access Web-based applications and visually follow other users' online activities in real time (Chua et al., 2006). Users are supported by software that synchronizes actions on websites and supports them with co-navigating the Web with devices such as desktop computers, mobile phones, or tablets (Lowet and Goergen, 2009). Traditional co-browsing applications in business setting (B2B or B2C) include online live support and guided sales.

In this paper, we define *social co-browsing* as co-browsing with a focus on end-user or consumer-to-consumer interaction. Social co-browsing enables users to shop online together, share their experiences, or make recommendations for purchasing a certain product (Goswami et al., 2007, Zhu et al., 2010). These social co-browsing activities also include watching online video clips, editing pictures, planning a route, choosing a movie together, or playing the same game (Lowet et al., 2007).

A key requirement for collaborative shopping tools is ease of use (Zhai and Zhang, 2014). Use of such tools must be self-explanatory to all users, who do not have to pre-register for, or pre-install, the application before using it (Esenther, 2002). Furthermore, co-browsing should be accessible from virtually any device, system, or location to simplify the users' spontaneous collaboration. Furthermore, scalability of the application is essential to secure its stability and guarantee fast response time in case many users access the co-browsing tool simultaneously (Hoyos-Rivera et al., 2006).

Co-browsing applications can be Internet-based, Web-based, browser-based, or browser-native (Thum and Schwind, 2010). The degree of support for real-time collaboration varies. For example, the synchronization speed of a virtual mouse pointer differs depending on how much bandwidth the co-browsing system uses. A Web-based screen-sharing tool that transmits graphical or video streams consumes more bandwidth than a browser-native co-browsing system that relies on event synchronization only. Normally, a master–slave model limits collaboration in one direction (Goswami et al., 2007). Users involved can share information on their screens, but not engage in collaboration with respect to the content of the information (Tee et al., 2006). In contrast, new generation co-browsing tools enable collaborative work through simultaneous interactions on the shared webpage (Yue and Jiang, 2013, Yue et al., 2014).

2.2 Studies on Social Co-Browsing for Online Collaborative Shopping

To date, most studies on co-browsing have focused on design, implementation, and evaluation of the general concept (Aneiros and Estivill-Castro, 2005, Chua et al., 2006, Esenther, 2002, Hoyos-Rivera et al., 2006, Lowet and Goergen, 2009, Sidler et al., 1997). However, an interesting area of research has emerged on social co-browsing for online collaborative shopping, and most related studies have been published in information systems (IS) outlets. As this is still an emerging research field, the foci, contexts, and theories of these studies are diverse. Online Appendix A details these studies, which we summarize as follows. Two studies involved non-empirical theory building (Goswami et al., 2007, Grange and Benbasat, 2013a). Another study investigated factors that foster the adoption of collaborative shopping in China (Zhai and Zhang, 2014). One examined the effects of adding recommendation agents to collaborative shopping (Huang et al., 2011). Two others examined social networking-related collaborative shopping (Grange and Benbasat, 2013a, Grange and Benbasat, 2013b). Another studied the sustainability aspects of social shopping (Chung et al., 2014). Several others examined the general factors causing the intentions to purchase through co-browsing (Shiau and Luo, 2012, Siau et al., 2013, Yang and Mao, 2014, Yeh et al., 2014). Finally, a more consistent group of studies considered the design and collaboration that influence intentions to use or reuse collaborative shopping and associated outcomes (Kim et al., 2013,

Yue and Jiang, 2013, Yue et al., 2014, Zhu et al., 2010). Our research builds on the latter group.

Zhu et al. (2010) investigated the effects of collaborative online shopping support tools on coordination performance and social presence. They used two design components, namely, communication support (i.e., text chat and voice chat) and shared navigation (i.e., page push), the latter of which is a simple form of co-browsing. They use media richness and common ground theory to explain how these technologies can help users coordinate their behavior effectively. A laboratory experiment with 128 subjects was conducted and results showed shared navigation reduces communication exchanges and leads to a higher coordination performance. Shared navigation and chat enhances the subjects' perception of social presence compared to separated navigation. They found that the benefit of shared navigation is higher when using text chat than when using video chat. Interestingly, although one of their two dependent variables (DVs) was social presence, they did not leverage social presence theory (SPT), which is normally used to predict social presence. Instead, they used common ground theory and media richness theory.

Kim et al. (2013) studied design components that contribute to one's intention to shop online with others. They examined how two components—embodiment and media richness—can enhance the shopping experience. The first component was implemented as a personalized avatar, and the second one as a text chat or video chat embedded in the shopping website. Via experiment, they investigated whether these components increased co-presence, flow, enjoyment, and the intention to shop online. They found that the presence of an avatar significantly increases co-presence. They further confirmed that media richness plays an important part in establishing co-presence and hedonic values, motivating shoppers to continue the collaborative shopping experience.

Furthermore, Yue and Jiang (2013) investigated how to enhance shared understanding in collaborative online shopping by using an experimental method with various types of shared navigation. They leveraged media synchronicity theory to show that split-screen co-navigation while shopping online increases shared understanding, which influences shopping decision quality and the intention to revisit the online store. They also showed that tightly bonded shared navigation that uses a location cue and not a

split screen results in both less shared understanding and less intention to revisit the store.

Finally, Yue et al. (2014) carried out an experimental eye-tracking study to explore the influence of various co-navigation treatments on collaborative online shopping conducted by co-shopper dyads. They used multiple theories as the basis for examining coordination, concentration, and comprehension. They showed that a shared screen view best improves coordination, a split screen encourages more diverse product searches, and a navigation screen with a location cue is the least distracting.

2.3 Conceptualizing User Engagement

User engagement has been defined in different ways, depending on the research perspective and context (Kappelman, 1995, Omar and Ali, 2011, Ray et al., 2014). Flow theory, play, cognitive absorption (based on flow theory), and information interaction refer to possible aspects of user engagement with a system. User engagement is often described as being influenced by two distinct concepts: user involvement and user participation (Barki and Hartwick, 1994). User involvement is a psychological construct and user participation is a behavioral construct (Lin and Shao, 2000). When users provide input and feedback to systems design, they participate actively. This participation leads to higher quality results, frequent use, and user satisfaction (Hwang and Thorn, 1999). When users are satisfied, their involvement increases; consequently, they are more engaged in the system and aim to fulfill their psychological desires through use of the system (Hwang and Thorn, 1999, Ray et al., 2014). The higher the user satisfaction and user engagement, the greater the success of the system (DeLone and McLean, 1992, Hartwick and Barki, 1994, Ray et al., 2014). A meta-analysis confirmed that a positive correlation exists between user participation, user involvement, and system success (Hwang and Thorn, 1999). Hence, increasing user engagement is a paramount goal for a system designer.

O'Brien and Toms (2008) reviewed and analyzed flow theory, aesthetic theory, play, and information interaction to deduce user engagement attributes. Although all these aspects contributed to their conceptualization of engagement, they determined that it is fundamentally rooted in flow theory, as this theory explains more aspects of engagement than other perspectives. Flow theory focuses on the motivation of users to focus deeply on a challenging activity, which occurs in subsequent stages over time

(Csikszentmihalyi, 1990). Flow can be simply described as a loss of self-consciousness and as self-reinforcing process that is immersive (Csikszentmihalyi, 1990). Hence, users become completely absorbed in an activity and forget about their surroundings. Similar findings on cognitive absorption, which builds on flow, have been found in hedonic systems use contexts (Lowry et al., 2013).

Given this background, O'Brien and Toms (2008) hypothesized that the sensory appeal of a system (i.e., its aesthetics)[i], the level of feedback (i.e., information interaction)[ii], and the challenge (i.e., playing)[iii] that users receive from this system are interaction features that foster engagement and create immersive experiences (similar to flow).

O'Brien and Toms (2010) further expanded engagement into six distinct constructs that they validated carefully and measured in successive studies; this conceptualization is more extensive than previous efforts to explain engagement. For this reason, we have leveraged their conceptualization. They defined six engagement constructs as follows: *aesthetics* is the degree to which the visual appearance of the interface is perceived as pleasing and attractive; *perceived usability* is the degree to which a system is perceived as easy to use, lacks confusion, and is not frustrating; *novelty* refers to perceived unexpected or surprising elements, experiences, or features that arouse interest and curiosity; *focused attention* is defined as producing a psychological state of mind with a concentration of mental activity that makes one forget one's surroundings; *felt involvement* refers to causing a state of psychological identification with some object that draws users into a task or the experience of enjoyment; and *endurability* is the extent to which system users find the experience worthwhile and successful and would recommend it to others.

Similarly, Cheung et al. (2015a) propose two kinds of engagement, namely: psychological engagement and behavior engagement. There are three dimensions in psychological engagement: vigor, absorption, and dedication. They further build on work by Patterson et al. (2006) to explain these dimensions: *vigor* is defined as customers' level of energy and mental resilience while playing an online game, and the willingness to invest time and effort in his/her role as a game player. *Absorption* refers to the customer concentrating fully, being happy, and being deeply engrossed in an online game, whereby time passes quickly. *Dedication* refers to the customer's sense of significance, enthusiasm, inspiration,

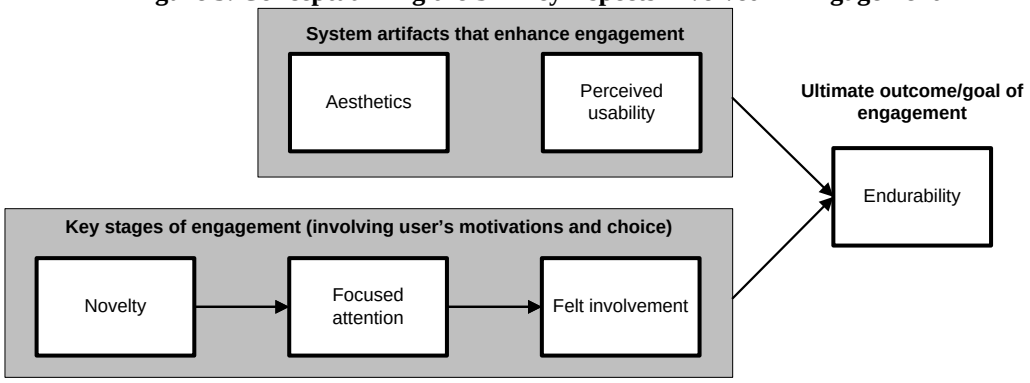
pride, and challenge towards an online game. From these definitions, we can infer that absorption is equivalent to the definition of focused attention and dedication is equal to O'Brien and Toms' (2008) definition of felt involvement. Therefore, engagement in our model is regarded as pschological engagement rather than behavioral engagement.

Crucially, similar to flow theory (Csikszentmihalyi, 1990) on which these conceptualizations are largely based, these distinct constructs occur in different stages and magnitudes. That is, these aspects of engagement do not create one second-order factor. Recently, researchers building on flow established that such constructs form a causal chain and must remain distinct in such models, and thus they should not be combined into second-order factors (Lowry et al., 2013). Notably, both aesthetics and usability are unique in that they describe factors that are solely in a system designer's control and that users do not choose. In contrast, novelty, focused attention, and felt involvement are successive stages of engagement that a user chooses to further experience and that are influenced by his/her motivations and interactions and, in our context, his/her collaborator. If they do not enjoy the experience or find their intrinsic motivations fulfilled, they drop out or begrudgingly continue to where they are not immersed and pleased. Hence, the ultimate sign of successful engagement that a user chooses is experiencing endurability from the interaction. On this basis, *user engagement* in our context refers to a multi-stage concept that describes users' interaction with a shopping system based on its designed aesthetics and usability; its ability to stir a sense of novelty in its users, focus their attention, and capture their felt involvement; and, ultimately, its ability to impel them to increased feelings of endurability from the interaction. This conceptualization of engagement is depicted in Figure 3. Essentially, it is the willful and personal aspects of engagement that can be positively influenced by co-presence, whose constructs we describe next.

2.4 Social Presence, Co-presence, and Social Presence Theory (SPT)

The collaborative shopping experience depends largely on the communication medium. Whereas media richness theory explains the fit between media richness and information exchange, SPT contributes to studying the inherent social qualities of different communication media. Social presence involves the degree of salience or presence (Short et al., 1976) between users that are connected by a

Figure 3. Conceptualizing the Six Key Aspects Involved in Engagement



telecommunication medium; that is, it is the degree to which another person is discerned as a present, authentic person online during communication (Gunawardena and Zittle, 1997). Thus, *social presence* is defined as the degree of awareness that another person is present in an interaction (Sallnäs et al., 2000, Short et al., 1976). Hence, *online social presence* can be defined as the sense of awareness of the presence of an interaction partner in an online interaction. To explain this construct in our context, we leverage SPT.

The basic idea of SPT, from which social presence derives, is that a communication medium's social effects are generally caused by the degree of social presence that it affords to its users (Short et al., 1976). This sense of presence is important for the process by which people come to know and interact with others (Short et al., 1976). Thus, increased social presence leads to a better interpersonal perception and related social results. For example, social presence "helps in establishing warm and personal connections between people in a communication setting" (Goswami et al., 2007, p. 36). Consequently, SPT asserts that a communication interaction will be more effective if the communication medium has the social presence level appropriate for the interpersonal involvement required for a task. Such presence is delivered in various ways online, such as chat and video (Goswami et al., 2007).

For our purposes, the face-to-face medium is considered to have the most social presence, and written, text-based communication the least social presence (Goswami et al., 2007, Short et al., 1976, Zhu et al., 2010, Brown et al., 2010). SPT also assumes that in any interaction involving two parties, both parties are concerned both with acting out certain roles and developing or maintaining some sort of

personal relationship. These two aspects of an interaction are termed interparty and interpersonal exchanges, respectively (Short et al., 1976). Accordingly, an inappropriate level of social presence can undermine both the interparty and interpersonal exchanges and thus undermine the interaction. Conversely, an appropriate level of social presence should enhance the interaction (and subsequently enhance the related engagement involved).

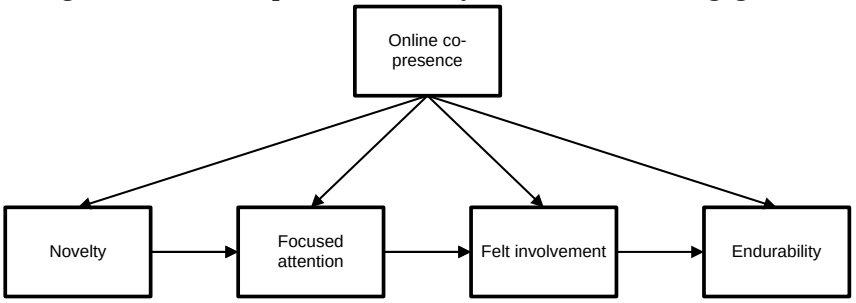
Social presence was originally studied related with face-to-face, audio, and interactive television encounters. However, the emergence of computer-mediated communication (CMC) and websites created an entirely new context to which SPT has been extended. Hence, the choice of communication medium influences the ability to transmit personal cues that establish a feeling of social presence. In the case of high felt presence during online communication, the interaction may be judged as sociable, personable, and responsive (Yoo and Alavi, 2001). Hence, the choice of medium influences psychological presence. Psychological presence and social presence are two different concepts. The former concept focus on the feeling of presence of the other part when two distinct parties interact with each other whereas the later concept means the degree of awareness of the other person in a communication media interaction (Sallnäs et al., 2000, Lowry et al., 2010, Lowry et al., 2006). For example, a video chat conveys a higher social presence compared with a voice or text chat. Moreover, social presence is shown to be an experiential phenomenon; thus, different collaborators can experience different levels of social presence with the same collaborative technology (Brown et al., 2010).

On this SPT foundation, Biocca et al. (2001) further studied the causal indicators of social presence and determined that three factors create it: co-presence, psychological involvement, and behavioral engagement or commitment. They determined that the most fundamental, essential component was co-presence, as it can drive the other two. Kim et al. (2013) define *co-presence* as ‘the degree of recognition of the presence of other users’ (p. 171). *Psychological involvement* ‘refers to an observer’s understanding of the intention or thinking of another person by focusing on the other person’s emotional state’ (p. 171). *Behavioral commitment* is ‘the degree of perceived interdependency, connection, and responsiveness of the other person to the observer’s actions’ (p. 171). We thus focus on co-presence, as it

is the most vital driver of social presence, and it is directly influenced by IT artifact manipulations.

In our context, we are interested in the influence of the choice of communication medium that creates online co-presence and its effect on user engagement itself (not task performance). Based on Biocca et al. (2001), and Kim et al. (2013), we define online co-presence as the extent to which an online medium effortlessly and comfortably allows users to experience others as personable and present. We posit that this sense of online co-presence can further enhance three key stages of engagement that involve user motivation and choice (i.e., novelty, focused attention, felt involvement) and the ultimate outcome of endurability. In our context, we partially invoke such presence through manipulations of collaborative chat and co-browsing. Figure 4 depicts this co-presence extension to the underlying concepts involved in user engagement. We will further contextualize and justify these relationships in the next section.

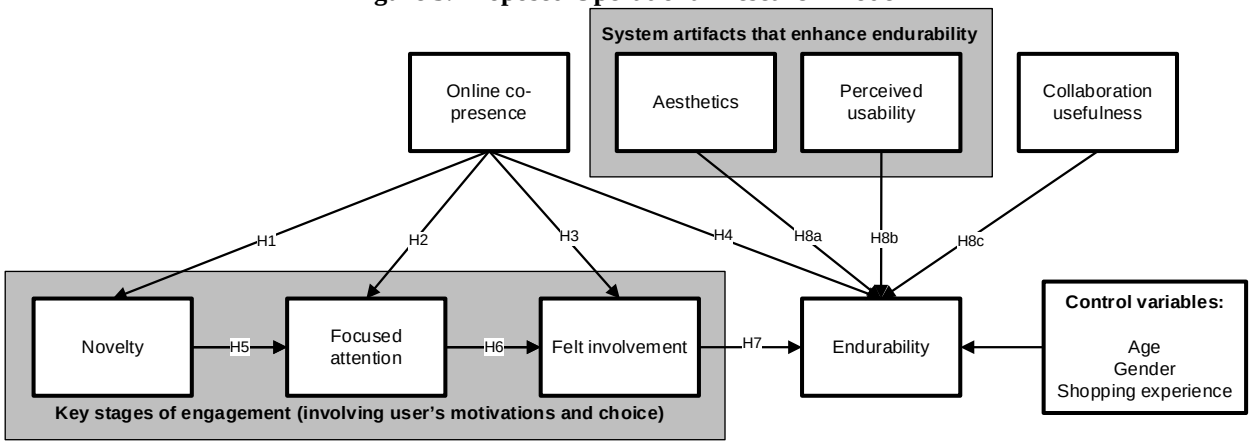
Figure 4. Online Co-presence as a Key Driver of Online Engagement



3. THEORETICAL MODEL AND HYPOTHESES

Figure 5 depicts our operational research model. In this section, we will explain the model, construct selection, and hypothesis development in detail. Our model builds on a multi-stage perspective of user engagement and extends it with the concept of co-presence, based on SPT and further refined by (Biocca et al., 2001, Kim et al., 2013). In our study, as two users shared the shopping experience in real time, we measured the influence of co-presence on the user engagement attributes. Our hypotheses focused on how co-presence in social co-browsing and with text chat would influence the main attributes of co-presence and, subsequently, influence user engagement.

Figure 5. Proposed Operational Research Model



Again, our conceptualization of user engagement is based on the sub-constructs from O'Brien and Toms (2010), consisting of felt involvement, focused attention, novelty, perceived usability, aesthetics, and the end result of endurability. We predicted that novelty would lead to focused attention, and focused attention would lead to felt involvement and ultimately increase endurability. Aesthetics and usability are systems design artifacts that further enhance endurability. Collaboration usefulness is a further experience that enhances endurability.

3.1 Hypotheses Driven by Co-Presence

Our first four hypotheses detail how online co-presence can influence three key stages of engagement that involve a user's motivations and choice (as opposed to aesthetics, usability, which are more directly related to the artifacts of system design): novelty, focused attention, and felt involvement. We will next explain how they influence the ultimate outcome of endurability.

In terms of the first engagement stage, namely novelty, our first assumption is that shopping online alone is inherently less novel than shopping with someone else and that co-presence enables this novelty. To understand this connection, it is crucial to better understand novelty in a collaboration context. Recall that novelty refers to unexpected or surprising elements, features, or experiences that arouse interest and curiosity (O'Brien and Toms, 2010). Such novelty commonly occurs when one experiences something new or unusual (Huang, 2003). Given that singular online shopping is the norm, and most consumers do not shop by using co-browsing—particularly with someone whom they do not

know, as participants did in our study—most consumers would consider such an experience to be novel. Moreover, multiple studies have shown that collaborative shopping is more enjoyable than shopping alone because of the more interesting social interaction that occurs (Tauber, 1972); this relationship extends to online collaborative shopping (Kim et al., 2013).

H1: An increase in co-presence is associated with increased novelty.

Focused attention is defined as the concentration of mental activity toward an object or task (Matlin, 2009, O'Brien and Toms, 2010). We posited that the presence of another in a shopping activity would help online shoppers focus on this task and not be distracted by other activities, at least as long as the other user is also focused on shopping. Likewise, as co-browsing and chat artifacts are not present when one shops alone, these artifacts should enhance the co-presence of the other and further serve to increase attention. A similar effect was observed among those using virtual avatars to increase social presence and attention in online collaboration (Bente et al., 2008). One online co-shopping study showed that co-navigation aids in increasing awareness of the experience (Zhu et al., 2010). More importantly, an online co-shopping study found that IT artifacts that increase interaction with other co-shoppers heightens shoppers' focus, understanding, and learning, because such artifacts appeal to shoppers' underlying motivations and heighten their sense of immersion and thus increase 'concentration on a collaborative online shopping website' (Kim et al., 2013, p. 173).

H2: An increase in co-presence is associated with increased focused attention.

After focused attention, the next key stage of engagement is felt involvement. Again, felt involvement is a state of psychological identification with some object that draws ones into a task or the experience of enjoyment (Kappelman, 1995, O'Brien and Toms, 2010). This involves a positive emotional response that is connected to a sense of psychological identification with the object (Kappelman, 1995). Assuming that a shopper is socially inclined, the psychological presence of another shopper is likely to help the person become more involved and derive greater enjoyment from the online shopping experience. Similarly, social presence induced by personal user interface elements significantly increases online shoppers' enjoyment (Hassanein and Head, 2007). Furthermore, IT artifacts that increase co-

presence also increase the interaction between co-shoppers (Kim et al., 2013). Co-presence in the form of conversing with other shoppers simultaneously on the same shopping website is likely to increase felt involvement.

H3: An increase in co-presence is associated with increased felt involvement.

In terms of our final co-presence hypothesis, endurability is depicted as a main outcome of user engagement (O'Brien and Toms, 2008). In our context, this describes the degree to which online shoppers find the experience worthwhile and would recommend it to others. We argue that if H2 (co-presence increases focused attention) and H3 (co-presence increases felt involvement) hold, then a user is more likely to perceive a successful and rewarding shopping experience. Likewise, a shopping co-browsing experience that increases immersion increases one's intention to use the collaborative shopping website, because an immersive experience is generally more enjoyable than a non-immersive experience and is more in line with the social and hedonic motivations underlying co-shopping (Kim et al., 2013). The more enjoyment the customer feels, the more likely he/she will continue shopping with this website and recommend it to others. Consequently, endurablity is more likely to increase than to decrease. Thus, we have following hypothesis:

H4: An increase in co-presence is associated with increased endurability.

3.2 Hypotheses Focused on Engagement

In this section, our hypotheses focus on the inter-relationship between the engagement constructs and the eventual outcome of endurability. We will start by explaining and predicting the relationship between novelty and focused attention. Novelty drives the user's curiosity to explore a system and to engage with it repeatedly (Webster and Ho, 1997). Likewise, new online content may sustain the attention of users over longer periods of time (O'Brien and Toms, 2010, Pace, 2004). Also, basing their work on flow theory, Lowry et al. (2013) explained the causal mechanisms that tie novelty to an increase in focused attention. Regarding attention, novelty increases curiosity as well as attention; conversely, boredom undermines attention (Posner and Boies, 1971). People pay attention to stimuli that are

personally interesting or novel. The more curious people are about a particular set of novel stimuli, the more attention they will be willing to devote to pursuing that curiosity. Finally, greater levels of co-shopping immersion link to greater concentration and focus on the co-shopping experience (Kim et al., 2013).

H5: An increase in novelty is associated with an increase in focused attention.

If users become immersed in the shopping experience, they ignore the external environment and are less easily distracted. This leads to greater felt involvement. Recall that felt involvement is defined as a state of psychological identification with some object that leads one to be drawn into a task or the experience of enjoyment (O'Brien and Toms, 2010). Distortions in the users' perception of time (for the user, time flies by) are commonly used to measure attention (O'Brien and Toms, 2008, Webster and Ho, 1997). This is similar to the description of immersion in the flow literature, in which immersion is the consequence of multiple stages of increased attention over time and enjoying the experience (e.g., Wild et al., 1995, Witmer and Singer, 1998, Ermi and Mäyrä, 2005, Brown and Cairns, 2004, Chen, 2007, Jennett et al., 2008, Weibel et al., 2008, Lowry et al., 2013). Likewise, in our context, increased focus and attention on the experience lead to more immersive involvement, as seen in Kim et al. (2013).

H6: An increase in focused attention is associated with increased felt involvement.

Again, felt involvement describes a positive emotional response due to interacting with a system and a collaborator. A study on behavioral intentions to use a system, found that psychological involvement plays a significant role in positively shaping user perception (Jackson et al., 1997). If users have fun engaging in the collaborative activities, they will likely remember this experience and desire to have it again, which will lead to immersive felt involvement. Similarly, the flow literature shows that if persons have a highly involved, immersive experience with a system in which they achieve enjoyment, they are much more likely to view the experience positively and want to have it again in the future. For example, focused immersion and temporal dissociation are strongly correlated with the behavioral intention to use (BIU) a system (Agarwal and Karahanna, 2000, Lowry et al., 2013). Finally, Kim et al. (2013) found a positive relationship between co-shopping immersion and the intention to use a co-

shopping website. Assuming that these mechanisms would hold in our context and in the related construct of endurability, we predict:

H7: An increase in user involvement is associated with increased endurability.

3.3 System Artifacts and Experiences that Further Enhance Endurability

Next, we consider two system design artifacts that will further enhance endurability: aesthetics, usability. Although these two factors may also be used to explain lower stages of engagement, high endurability is the ultimate DV and the strongest indicator of successful engagement. Therefore, for theoretical concision, endurability is our focus.

Moreover, the relationships between these constructs and continuation, systems use, adoption, satisfaction, and so on, are replete in the literature of multiple fields and are well understood. In fact, several studies have shown that these factors enhance each other and appear together (e.g., Tractinsky et al., 2000, Thüring and Mahlke, 2007, Lowry et al., 2013, Brown et al., 2010). We thus propose that these relationships are mere replications or covariates that enhance explanatory power in our model, without defending the well-known underlying causal mechanisms. Examples of such studies of aesthetics include (Tractinsky et al., 2000, Ben-Bassat et al., 2006, Thüring and Mahlke, 2007, O'Brien and Toms, 2010). Similar studies of usability (or perceived ease of use) include (Venkatesh and Davis, 2000, Ben-Bassat et al., 2006, Thüring and Mahlke, 2007, Lowry et al., 2013, Zhai and Zhang, 2014, Brown et al., 2010).

H8a. An increase in the perceived aesthetics of an online shopping system is associated with increased endurability.

H8b. An increase in the perceived usability of an online shopping system is associated with increased endurability.

Finally, we explored a usefulness construct, because considerable research has shown that usability (or perceived ease of use) and usefulness usually complement each other in system artifact continuance and adoption evaluations. This was also recently validated in a Chinese collaborative online shopping context (Zhai and Zhang, 2014). Rather than using a generic usefulness construct, we slightly modified it from (Venkatesh and Davis, 2000) to contextualize it to the usefulness of the collaboration

with the shopping system that we chose. We formally define *collaboration usefulness* as the extent to which a user finds the collaboration experience helpful and productive in achieving his/her task. This goes beyond IT design artifacts and is more about the overall collaboration experience.

H8c. An increase in the perceived collaboration usefulness of an online shopping system is associated with increased endurability.

4. METHODOLOGY

4.1 Experimental Design

To test our model, we designed a survey-based, online free-simulation experiment. This methodology is similar to experimental simulation in that we designed a realistic but closed setting and measured the response of human subjects when they interacted within the system. Further, we had a control group and two treatment groups. However, the experimental controls and manipulations in a free-simulation experience are not as strict as in a traditional experiment, and they are typically used in conjunction with path modeling. In the free-simulation experiment, the events and their timing are determined by both the researcher and the behavior of the human subjects. This is particularly useful to increase the realism in website experimentation, as in this study, because participants choose to interact with and surf the experimental website (and with a collaborator, where applicable) in a naturalistic manner, as seen in various other studies (Gefen et al., 2003, Lowry et al., 2012). This choice is more appropriate for use of SPT, because social presence 'is an experiential phenomenon that it is possible for different users to perceive different levels of social presence for a given technology' (Brown et al., 2010, p. 19), and thus strict experimental controls are not possible with social presence.

For the experiment, we used a demo installation of PrestaShop (http://www.prestashop.com) with a default theme and containing a selection of Apple products. Participants were randomly allocated to one of three groups that are summarized in Table 1.

4.2 Screening Procedures and Participants

The survey was initiated on a Friday evening in the fall of 2013. After about 4 hours, we had collected the desired 300 survey responses. Mechanical Turk showed an average time per assignment of

Table 1. Experiment Groups and Participants

Group	Treatment	Participants	Age	Gender
1	Two workers connect with co-browsing only	55	18-25: 33% 26-35: 49% 36-45: 15% 46-55: 0% 56+: 3%	Male: 61.8% Female: 38.2%
2	No co-chat+ No co-browsing (control group)	120	18-25: 20.8% 26-35: 40.8% 36-45: 30.8% 46-55: 0% 56+： 7.6%	Male: 57.5% Female:42.5%
3	Two workers connected with live chat	59	18-25: 25.4% 26-35: 44% 36-45: 32.2% 46-55: 5% 56+: 0%	Male 52.5% Female 47.5%
4	Two workers connected with live chat and co-browsing	114	18-25: 25.4% 26-35: 44.7% 36-45: 23.7% 46-55: 0 56+: 6.2%	Male 57% Female 43%

11 minutes, leading to an average hourly payment rate of a little more than 4 USD. We filtered out 14 respondents with incorrect answers (where the questions were not answered correctly or the answers for the shopping task were wrong) or incomplete responses, and 13 respondents who reported technical problems or who stated they had not been connected to a shopping partner in a timely manner. Another 31 participants had to be excluded from the chat and co-browsing samples because their assigned shopping partners stated that they did not receive a chat response from them.

This filtering process left us with 234 valid responses. Despite being assigned randomly, the control group with no social interaction was more prominent, with 120 responses, than the chat (59) and co-browsing (55) groups. The co-chat and co-browsing group has 114 respondents. In addition to the excluded responses with chat problems, this can be explained by the fact that many respondents dropped out of the task when they were not matched with a shopping partner. Some might also have dropped out because of the unexpected introduction of the social elements. Among the valid responses, 134 survey participants were male and 100 were female, with an average age of 34 years. Most participants were experienced and used online shopping sites very frequently (96 participants) or frequently (78 participants); 57 participants reported using these sites only occasionally, and 3 rarely.

4.4 Experimental Tool

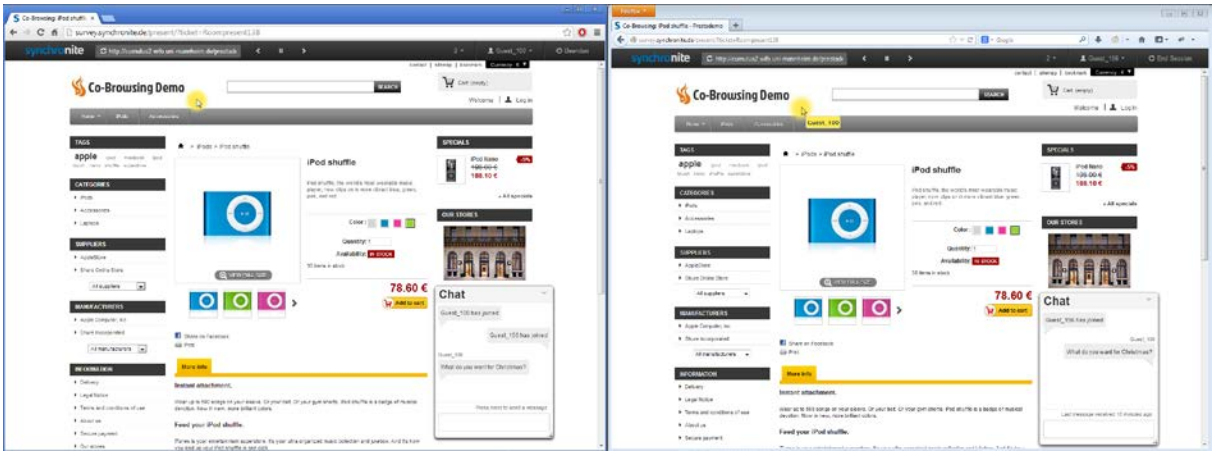
We recruited participants via the online labor marketplace Amazon Mechanical Turk (mTurk). mTurk is a marketplace for work, where one can post so-called human intelligence tasks that are self-selected and solved by people all over the world (Schulze et al., 2012). Studies in different research areas have shown that experimental results from participants recruited on mTurk are comparable with those of lab experiments or online experiments with student participants while obtaining the results is comparatively fast and inexpensive (Horton et al., 2011, Mason and Suri, 2012, Lowry et al., 2016).

4.3 Experimental Tasks and Procedures

Again, for the experiment, we used a demo installation of PrestaShop with a default theme which contains a selection of Apple products. To get participants experience the shop in a manner that would test our model, we gave them three simple tasks: to find products, product properties, and product prices. The two social groups were instructed to use chat tool to ask the shopping partner about his/her preferred Christmas present. These tasks were designed to encourage users to engage with the website and to use the social elements.

Participants were randomly allocated to one of three conditions. Participants in the first group (control condition) were directed to the shop alone. For the second and third groups, we used Synchronite (http://www.synchronite.net) (Thum and Schwind, 2010) as backend and created a queue where participants were paired in dyads and automatically redirected to join a session. The members of group two visited the same shop and could communicate with each other via text chat, located in the bottom right-hand corner of the screen. The third group was connected via co-browsing and text chat enabled by Synchronite. With co-browsing, both participants could browse the website together and see each other's mouse pointer. If one user clicked on a link, the page would be opened in the browser of the other user as well. Participants can also use text chat to communicate with each other. Figure 6 provides a screenshot of the co-browsing environment 4.

Figure 6. Screenshot of Our Demo Online Shop with Synchronite Header



Note: In this screenshot, co-browsing and chat are both enabled. The users' actions are synchronized (Chrome, left; Firefox, right).

4.5 Measures

After completing the shopping experiment, participants received a survey. The questions were based on the constructs of our model, adapted mostly from related work, and were reviewed by experts prior to the experiment. The questions are listed in Online Appendix B. The items regarding co-presence were deleted from the first group. After capturing the basic demographic information used for controls, the respondents received a unique response code that they could enter into mTurk for compensation.

5. DATA ANALYSIS AND RESULTS

Except where noted, all model analyses were conducted with partial least squares (PLS) regression by using SmartPLS version 2.0 (Ringle et al., 2005), because PLS is more appropriate than covariance-based structural equation modeling (SEM) for preliminary model building and for analyzing less normalized data, which best describes our data, than do covariance-based SEM (CB-SEM) techniques (Fornell and Larcker, 1981, Chin et al., 2003, Peng and Lai, 2012, Lowry and Gaskin, 2014). In contrast, CB-SEM is more appropriate than PLS in cases of testing highly developed, known models with highly normalized data (Chin et al., 2003, Peng and Lai, 2012, Lowry and Gaskin, 2014). We followed the latest standards for executing PLS, as demonstrated in Gefen and Straub (2005), Cenfetelli and Bassellier (2009), and Peng and Lai (2012), Lowry and Gaskin (2014). First, we conducted an

extensive pre-analysis and data validation according to these latest standards with four purposes: (1) to check the factorial validity of the measures (convergent and discriminant validity); (2) to ensure that multi-collinearity was not a problem with any of the measures; (3) to check for common method bias through the marker-variable approach; and (4) to establish strong reliabilities. These details are supported in Online Appendix C. Table 2 summarizes the measurement model statistics. Table 3 summarizes the reliabilities and variance inflation factors (VIFs).

Table 2. Measurement Model Statistics and AVEs (n = 234*)

Latent Construct	M	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Focused attention (1)	3.44	1.51	0.843							
Usability (2)	5.50	1.33	0.262	0.844						
Aesthetics (3)	5.14	1.25	0.364	0.568	0.947					
Endurability (4)	4.54	1.33	0.550	0.504	0.684	0.892				
Novelty (5)	4.55	1.33	0.567	0.392	0.571	0.788	0.834			
Involvement (6)	5.08	1.32	0.554	0.485	0.584	0.737	0.749	0.910		
Co-presence (7)	4.82	1.46	0.529	0.502	0.438	0.709	0.620	0.675	0.846	
Collaboration usefulness (8)	4.38	1.71	0.512	0.355	0.472	0.733	0.690	0.582	0.714	0.913

* n was 234 for all measures except co-presence and collaboration usefulness, which were not asked of the control group (for these two constructs, n = 113); bolded and underlined values represent square roots of the AVEs.

Table 3. Reliability and Variance Inflation Factors (VIFs)

Latent construct	Composite reliability	Cronbach's α	VIFs
Aesthetics	0.963	0.943	2.364
Collaboration usefulness	0.952	0.933	2.827
Endurability	0.921	0.872	5.176
Focused attention	0.907	0.864	1.639
Involvement	0.906	0.793	3.361
Novelty	0.872	0.780	3.958
Co-presence	0.910	0.867	2.931
Usability	0.881	0.800	1.729

5.1 Final Results and Post-Hoc Analysis

We analyzed the entire sample as well as the subgroups of the three samples separately. Finally, in the next section, we show how we used PLS multi-group analysis (MGA) approach to find and report specific differences between the results of chat and co-browsing. Bootstrapping with 5,000 samples in SmartPLS 2.0 was used to test the significant levels of the path coefficients. Figure 7a (model A), Figure 7b (model B), Figure 7c (model C), and Figure 7d (model D) summarize the results, which are detailed in

Table 4. Most of our hypothesized relationships were supported, which we will further address in the discussion section. Following Peng and Lai (2012), we also conducted a post-hoc analysis to assess the effect sizes in our model, statistical power, and the Stone-Geisser blindfold.

5.2 Effect Sizes of Results

Effect sizes cannot be estimated from SEM beta coefficients; instead, a conservative approach is to use Pearson's *r* among the supported paths (Peng and Lai, 2012). Appendix C Table C3 summarizes this analysis, showing mostly large to very large effect sizes.

Figure 7a. Model A (Co browsing only)

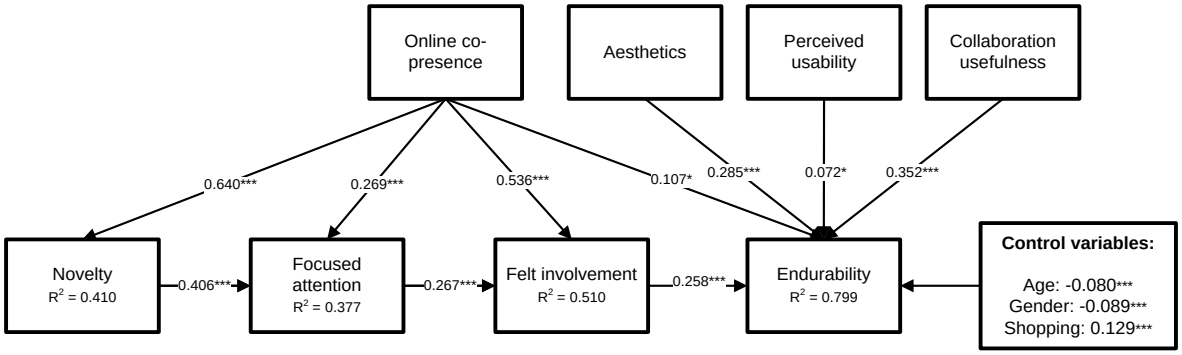


Figure 7b. Model B (Control group: No Chat, No Co-browsing)

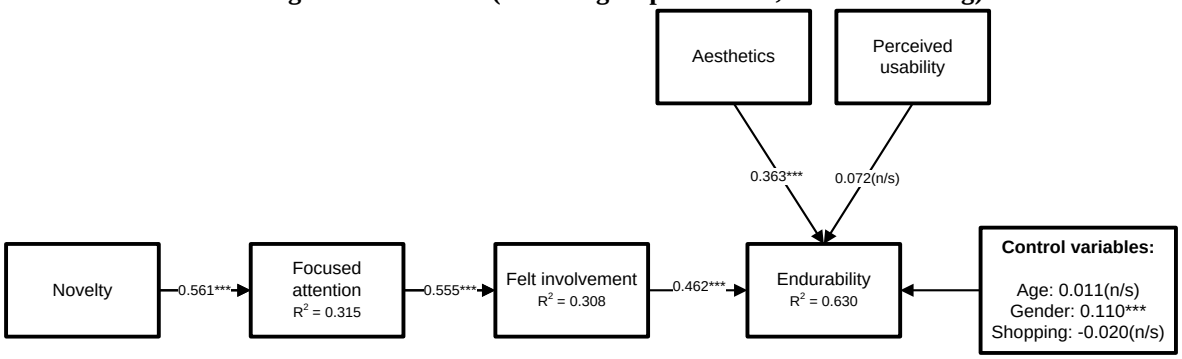


Figure 7c. Model C (Treatment: Chat Only)

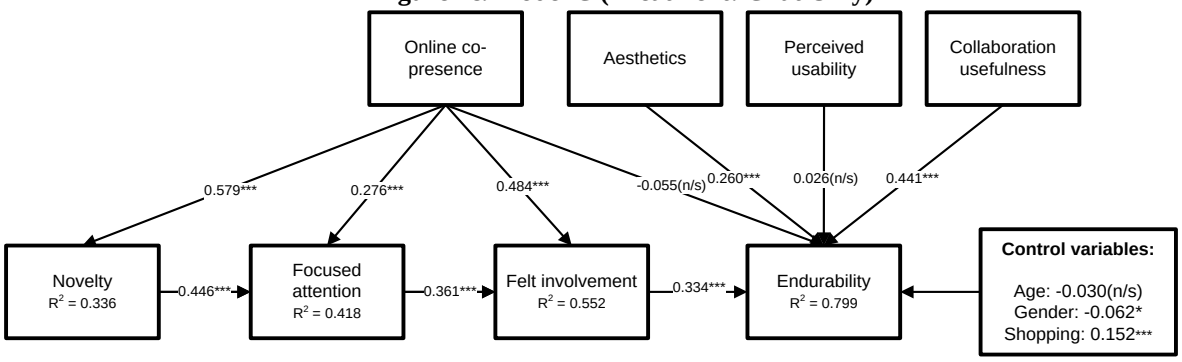


Figure 7d Model D. (Treatment:Co-Chat+Co-browsing)

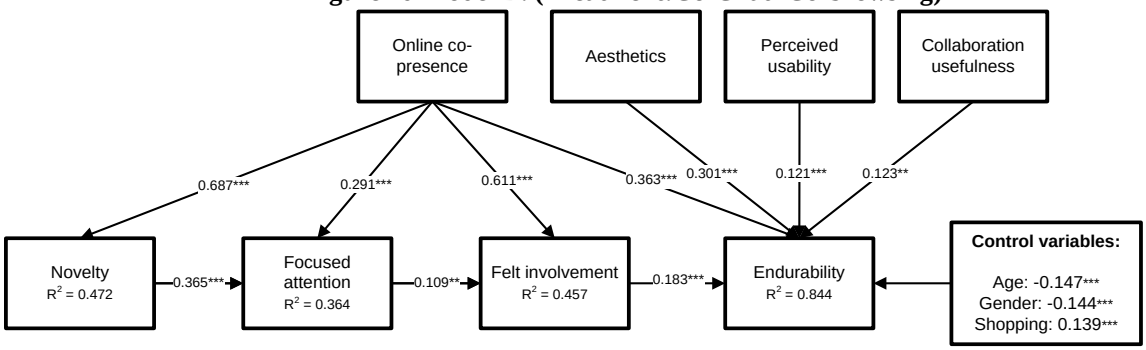


Table 4. Results of Structural Equation Model Testing on All Four Models

Tested path	β	*t*-value	Sig.?
Model A: co-browsing			
H1. Co-presence → novelty	0.640	21.77***	Yes
H2. Co-presence → focused attention	0.269	5.89***	Yes
H3. Co-presence → felt involvement	0.536	11.50***	Yes
H4. Co-presence → endurability	0.107	2.31*	Yes
H5. Novelty → focused attention	0.406	8.96***	Yes
H6. Focused attention → felt involvement	0.267	6.34***	Yes
H7. Felt involvement → endurability	0.258	6.85***	Yes
H8a. Website aesthetics → endurability	0.285	9.42***	Yes
H8b: Website usability → endurability	0.072	2.35*	Yes
H8c. Collaboration usefulness → endurability	0.352	7.96***	Yes
Control: age → endurability	-0.080	3.77***	Yes
Control: gender → endurability	-0.089	4.06***	Yes
Control: online shopping experience → endurability	0.129	5.43***	Yes
Model B: Control (no chat and no co-browsing + chat)			
H5. Novelty → focused attention	0.561	19.97***	Yes
H6. Focused attention → felt involvement	0.555	19.01***	Yes
H7. Felt involvement → endurability	0.462	11.73***	Yes
H8a. Website aesthetics → endurability	0.363	8.11***	Yes
H8b: Website usability → endurability	0.072	1.69(n/s)	No
Control: age → endurability	0.011	0.44(n/s)	No
Control: gender → endurability	0.110	3.70***	Yes
Control: online shopping experience → endurability	-0.020	0.70(n/s)	No
Model C: Chat only (no co-browsing + chat treatment)			
H1. Co-presence → novelty	0.579	22.66***	Yes
H2. Co-presence → focused attention	0.276	6.16***	Yes
H3. Co-presence → felt involvement	0.484	13.40***	Yes
H4. Co-presence → endurability	-0.055	1.85(n/s)	No
H5. Novelty → focused attention	0.446	11.49***	Yes
H6. Focused attention → felt involvement	0.361	8.86***	Yes
H7. Felt involvement → endurability	0.334	7.64***	Yes
H8a. Website aesthetics → endurability	0.260	7.86***	Yes
H8b: Website usability → endurability	0.026	1.01(n/s)	No
H8c. Collaboration usefulness → endurability	0.441	11.69***	Yes
Control: age → endurability	-0.030	1.15(n/s)	No
Control: gender → endurability	-0.062	2.06*	Yes
Control: online shopping experience → endurability	0.152	5.95***	Yes
Model D: Chat + co-browsing (no chat-only treatment)			
H1. Co-presence → novelty	0.687	25.53***	Yes
H2. Co-presence → focused attention	0.291	7.92***	Yes

H3. Co-presence → felt involvement	0.611	13.99***	Yes
H4. Co-presence → endurability	0.363	8.02***	Yes
H5. Novelty → focused attention	0.365	8.15***	Yes
H6. Focused attention → felt involvement	0.109	2.70**	Yes
H7. Felt involvement → endurability	0.183	7.84***	Yes
H8a. Website aesthetics → endurability	0.301	11.80***	Yes
H8b: Website usability → endurability	0.121	4.07***	Yes
H8c. Collaboration usefulness → endurability	0.123	3.21**	Yes
Control: age → endurability	-0.147	7.25***	Yes
Control: gender → endurability	-0.144	7.22***	Yes
Control: online shopping experience → endurability	0.139	7.31***	Yes

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, n/s = not significant; ++Again, because the control groups did not work with others, co-presence was not gathered for the control groups.

5.3 Statistical Power

Statistical power was not an issue, because the predicted results were strongly supported by statistics. Nonetheless, our design was not ideally powered for path modeling, but it was reasonably close. On one hand, our sample size of 234 respondents far exceeded the minimum guidelines for PLS of a minimum sample size of 10 times the most complex relationship in the model (Peng and Lai, 2012). However, a more conservative approach is to follow the CB-SEM guidelines of a minimum of 10 samples per item (Westland, 2010). Our model, including control variables, had 26 indicators; thus, following these guidelines, it would have been ideal to have 260 respondents, not 234.

5.4 Predictive Relevance of Our Model

In terms of the Stone-Geisser blindfold, we calculated the Stone-Geisser (Q^2) test of predictive relevance that essentially tests whether a model can predict data points that are explicitly excluded. In PLS, when using Q^2 to examine the predictive relevance of one's theoretical model, one runs the blindfolding algorithm on latent constructs and, using a cross-validated redundancy, measures for Q^2 (Chin, 2010, p. 680). The Q^2 calculations for our four model runs were as follows: $Q^2 = 0.51$ (model A);

$Q^2 = 0.51$ (model B); $Q^2 = 0.47$ (model C); and $Q^2 = 0.52$ (model D). Notably, if $Q^2 > 0$, 'then the model is viewed as having predictive relevance' (Peng and Lai, 2012, p. 473). Thus, all the models had predictive relevance. More stringently, the most strongly predictive models had Q^2 above 0.50 (Chin, 2010); thus, three of our models were of the highest predictive quality, whereas one was good.

5.5 PLS Multiple-Group Analysis for Treatments and Control

We also compared the results for the three different groups (two treatments and one control). To do so, we used the PLS multiple-group analysis (MGA) method proposed by Keil et al. (2000) and supported by the tools from Hair Jr. et al. (2013). Appendix C Table C4 presents the results of the two treatment groups (chat vs. co-browsing with chat) compared with the control group (shopping alone). Next, we discuss the key results of this analysis.

6. DISCUSSION

Most studies on collaborative online shopping have focused on factors that influence purchasing online. In contrast, our study joins a smaller body of recent, compelling research that examines how IT artifact manipulations of co-browsing influence the co-shopping experience (e.g., Zhu et al., 2010, Yue and Jiang, 2013, Kim et al., 2013). Our unique contribution to the literature is the use of SPT and theories on engagement to explain the roles of co-presence and engagement in creating increased endurability for co-shoppers. To test our model, we conducted a free-simulation experiment with 234 consumers from Mechanical Turk. They were randomized to three conditions of co-presence (co-browsing + chat, chat only, or control condition with no co-browsing/chat). Their task involved working together (except for the control condition) on the PrestaShop website to search and shop for Apple products. To invoke the co-browsing IT artifacts, we used Synchronite (http://www.synchronite.net) as a backend to create a queue in which participants were paired in dyads and redirected automatically to join their assigned shopping condition. One treatment group could only communicate via a text chat, and the strongest co-presence treatment group was conducted via co-browsing and text chat powered by Synchronite.

6.1 Summary of Results

Given our free-simulation experiment manipulations, we tested our model in four subgroups: model A (co-browsing only); model B (control group; no co-presence); model C (chat-only treatment); model D (chat + co-browsing treatment). In examining the treatment groups separately, we found that all of the hypotheses were supported for the highest level of co-presence (model D), and most of the

hypotheses were supported for the lower level of co-presence (model C). Namely, an increase in co-presence was associated with increased novelty (H1 supported), focused attention (H2 supported), felt involvement (H3 supported), and endurability (H4 supported only for model D but rejected for model C). In terms of engagement-related constructs involving a user's motivation and choice, we found the following: Increased novelty was associated with increased focused attention (H5 supported); increased focused attention was associated with increased felt involvement (H6 supported): and increased felt involvement was associated with increased endurability (H7 supported). In terms of the system artifacts that enhance endurability, we obtained the following results: Increased website aesthetics were associated with increased endurability (H8a supported); increased website usability was associated with increased endurability (H8b supported only for model D but rejected for model C); and increased collaboration usefulness was associated with increased endurability (H8c). Overall, the substance of our theories regarding co-presence and engagement was supported. Moreover, the model was most strongly supported by the highest level of co-presence treatment (chat + co-browsing), resulting in a modest increase in variance explained from model C ($R^2 = 0.799$) to model D ($R^2 = 0.844$), or a 5.6% increase in explanation between the co-presence treatments.

In terms of exploratory covariates, we discovered some interesting patterns in models C and D. In both models, females had statistically lower endurability. This meant that males had a more positive experience with co-presence in collaborative shopping than females had. Moreover, in both models, endurability was positively influenced by previous general experiences with online shopping (not collaborative shopping). Whereas age had no influence on endurability in model C, it had a negative influence in model D. This means that older participants were more resistant to the higher forms of co-presence (chat + co-browsing) than they were to the simpler form (chat only).

The control condition was added as a realistic baseline of comparison to assess the level of engagement that likely occurs in solo online shopping, which is still a compelling, engaging experience that is highly popular, as it is the most common form of online shopping. Consequently, these control participants experienced no co-presence and thus were not asked about the co-presence. This allowed us

to better determine the added value (if any) of adding co-presence IT artifacts and experiences to online shopping. The base model of engagement was still supported with the control condition: Increased novelty was associated with increased focused attention (H5 supported); increased focused attention was associated with increased felt involvement (H6 supported); and increased felt involvement was associated with increased endurability (H7 supported). Hence, engagement is a vital part of solo online shopping. This finding is logical, as online shopping is popular and consumers generally find it enjoyable (Wolfinbarger and Gilly, 2001); hence, online shopping environments must be suitable for engagement. The results were split in terms of the systems artifacts that enhance endurability: Increased aesthetics was associated with increased endurability (H8a supported), but website usability was not (H8b rejected). Interestingly, females in the control condition had statistically increased endurability—as opposed to the males—indicating that females preferred the solo shopping condition more than males did. Interestingly, previous online shopping experience had no statistical influence on endurability in the control group.

It is notable that usability had a significant relationship with endurability for both Model A and D, both of which involved co-browsing. However, these were not significant when co-browsing was not involved (Model B and Model C). The straightforward likely reason for these results is that the higher interaction treatments (e.g., co-browsing alone or with chat) require more sophisticated, usable software interactions whereas the low-interaction interactions do not (e.g., chat only or no chat).

Finally, we ran some additional analyses with MGA in PLS to gain additional insights. Comparing the control group with the treatments enabled us to further establish that engagement was a compelling aspect of both solo shopping and collaborative shopping. It further confirmed that men in our sample had a stronger preference for co-presence, whereas women had a stronger preference for solo shopping. Moreover, the older participants preferred solo shopping over collaborative shopping. We also confirmed that the co-presence and engagement paths tended to be stronger in model D (highest co-presence) than in model C (chat only). Likewise, we confirmed that women and the older participants preferred model C more than model D.

6.2 Contributions to Research and Practice

Overall, we established that engagement is a fundamental factor to increase consumer endurability in both solo and collaborative shopping. However, our supported model indicates that endurability in online shopping can be further enhanced by adding co-browsing capabilities with IT artifacts to enhance co-presence. The strongest condition was collaborative shopping with co-browsing and chat (model D), and the next strongest condition was chat only (model C). These results suggest that richer collaboration techniques that enhances co-presence contribute directly to the long-term endurability of the shopping experience and customers' loyalty to the shopping site. This is particularly pivotal because, as noted, collaborative online shoppers spend more money than solo online shoppers do. Hence, fostering co-presence can not only improve the experience one has in collaborative shopping but also improve the selling amount of online retailers.

From an empirical view, we note that the explained variance (R^2) of all our models was high in explaining the DV of endurability, even for the control group ($R^2 = .630$). However, the highest level of explanation was demonstrated in the treatment that was purported to have the highest levels of co-presence ($R^2 = 0.844$). Practically speaking, our research demonstrates a 34% increase in explanation by including co-presence in the model. Such an increase is notable and is further supported by empirical results that had very strong effect sizes—meaning that the relationships had practical significance that should translate into meaningful results in practice, as the treatments effects are real and compelling. These findings are particularly gripping, as our models were not ideally powered statistically.

We also note our compelling prediction of the construct endurability to be a key contribution to research and practice. Although endurability is similar to behavioral intentions to use (BIU), they are not the same. BIU is oriented toward an experience that does not involve others. Endurability is a particularly compelling construct because it is not only about the intention to use; it also reflects whether a person thinks the experience was worthwhile and successful and would recommend it to others. Hence, endurability is particularly appropriate in the collaborative context, where social influence is highly relevant. Online retailers should desire more than BIU; they should aim for endurability, so their satisfied

consumers shop with others online and spread their positive experiences to others in their personal social networks. Ergo, we advise collaborative online shopping researchers to focus on predicting this construct over mere BIU.

In terms of theory building, we combined two research streams in a pragmatic manner that translates to direct recommendations for practice. Previous research showed that collaborative shopping support increases social presence (Zhu et al., 2010), although, ironically, it was not based on SPT. Other research investigated the link between collaboration, trust, and the intention to shop online together (Kim et al., 2013). This study established a link between collaborative shopping and co-presence as well as between co-presence and different manifestations of user engagement. Our research goes beyond a basic understanding of user engagement by measuring it and adding a real-time social layer to the single user Web experience. Hence, this study extends user engagement by adding a crucial social dimension. As social interaction on the Web has become pervasive, its influence on user engagement must be better understood, and our research increases that understanding in an online collaborative shopping context.

6.3 Limitations and Future Research

Although the effect sizes of our exploratory control relationships were not nearly as strong as the predicted relationships, these results point to some potential issues with co-browsing in online shopping. In particular, we found that older participants and women had a stronger preference for solo shopping and the lower-order co-presence condition of chat only, than for the higher level of co-presence involving chat and co-browsing. Several possibilities for the age effects include: old users are resistant to new technologies, they have a greater concern about privacy, or they're less willing to shop with someone they do not know. Because both groups were less resistant to chat only, this indicate that retailers might be able to appeal to these groups by allowing such users to start with lower co-presence options. Hence, we believe that retailers need to provide a choice of co-presence. Thus, future research should examine the influence of user choice on co-presence conditions versus assigned co-presence conditions, and to further investigate the effects of age and gender.

Another compelling possibility regarding gender provides future research orientation. Perhaps

female participants had more subdued reactions to co-shopping when they were assigned to shop with a stranger as opposed to shop with a friend. Research has shown that significant differences exist between men and women in the patterns and reasons for friendship and that men are likely to 'go it alone,' especially in stressful situations, whereas women in new and stressful situations are likely to seek for friends (Taylor, 2006, Taylor et al., 2000, Klein and Corwin, 2002). Hence, male participants in this study may have responded favorably to being assigned to shop with a stranger in a new task with which they were not familiar. Given the social nature of shopping and that gender differences could exist in the enjoyment of shopping online (Van Slyke et al., 2002), future research should consider dyads of actual friends (by using pairs of men and women) versus randomly assigned co-shoppers and examine whether familiarity affects endurability in collaborative online shopping. Other related extensions are to examine gender differences in shopping with live professional shopping assistants online and with virtual shopping recommendation agents (Huang et al., 2011).

Our results have limited generalizability because we did not examine every form of co-presence, and generalizability is always a limitation of experimentation. For example, we omitted the video and voice chat condition, as this is particularly difficult to set up consistently across different types of browsers. Such tests are better performed in a traditional laboratory, where all computers have the same setup. Other forms of co-presence can also be considered, including the use of avatars, pointers, and collaborative drawing. Co-presence research should also be extended to the use of smartphones and tablets, where location awareness can be uniquely added as a co-presence IT artifact (Keith et al., 2013). A final co-browsing opportunity for generalizability is extending this line of research to cross-cultural studies. To date, no one has examined the cultural differences and preferences that might moderate perceptions of co-browsing, whereas substantial IS research has indicated that cultural perceptual differences can greatly influence perceptions during IT use (Srite and Karahanna, 2006, Yoon, 2009, Im et al., 2011), and these effects are particularly strong in collaborative social experiences involving online technology (Posey et al., 2010, Kim et al., 2011, Lowry et al., 2011).

Another aspect of generalizability that requires more research is the nature of the task itself,

including the nature of the product the buyers shopped for. The types of products may play a vital role in the online shopping experience. Moreover, there must be a good fit between the online shopping system and the product characteristics, as well as the system users (Jahng et al., 2000). Thus, future research should consider more complex products/services to increase external validity.

Finally, more work is required in this area of research in terms of measurement. Although our study was based on well-validated measures—particularly those from O'Brien and Toms (2010)—little has been done in this context in terms of objective measures. Recent research has examined eye tracking and other neuroscience measures (Yue et al., 2014), and we believe this to be a fruitful area requiring much more work. Actual Web interaction measurements and Web analysis would be useful, from tracking mouse movements to actual purchases.

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Note to editors / reviewers: These materials are intended as online supplements to assist with the review process of the article. Should the article be accepted, we can make these available online or per request by the reader.

ONLINE APPENDIX A. LITERATURE REVIEW ON COLLABORATIVE ONLINE SHOPPING

Citation	Purpose and Context	DV(s)	Theory	Outlet type
(Cheng et al., 2013)	Examining the effects of navigation support and group structure on collaborative online shopping via an experiment that varies navigation support	Ease of use and usefulness	Situational awareness theory + dual task interference theory	Book chapter
(Goswami et al., 2007)	Theory-building, non-empirical paper proposing that a fit between the objectives of collaborative shopping (i.e., socializing and purchasing) and website features (i.e., communication support and decision support) to support the activity will result in higher process and outcome satisfaction.	Satisfaction (non-empirical)	SPT	IS conference
(Grange and Benbasat, 2013a)	Provide a non-empirical conceptual framework for investigating the drivers of the value captured by consumers embedded within social shopping networks	N/A (theory building)	Review of various theories	IS conference
(Grange and Benbasat, 2013b)	Research-in-process examining how a social network-enabled shopping environment influences product search as moderated by network scope.	Shopping satisfaction	Technology affordances and constraints theory	IS conference
(Huang et al., 2011)	Research-in-process explaining the role of product recommendation agents in collaborative online shopping that considers hedonic and utilitarian factors.	Purchase decision quality and enjoyment	Interaction process analysis	IS conference
(Kim et al., 2013)	Empirically examined how the design components of embodiment and media richness have a positive effect on intention to use collaborative online shopping through the mediators of co-presence, enjoyment, and flow.	Intention to use system	SPT; media richness theory	IS journal
(Shiau and Luo, 2012)	Empirical study predicting online group buying intention and satisfaction through reciprocity, reputation, trust, and perceptions of vendor's creativity.	Satisfaction and intention to purchase	Social exchange theory	HCI journal
(Siau et al., 2013)	Research-in-process experimental study examining the effects of variation intake types and communication support in collaborative online shopping.	Intention to purchase	Media richness theory + task-media fit theory	IS conference

Citation	Purpose and Context	DV(s)	Theory	Outlet type
(Yang and Mao, 2014)	Empirical study predicting purchase and search intentions through price, vendor, PEOU, and trust factors.	Purchase and search intent	TAM; adaptation level theory	IS conference
(Yeh et al., 2014)	Empirical study predicting consumer value creation in group online buying in terms of social capital and hedonic factors.	Consumer value creation	Social capital theory	IS conference
(Yue and Jiang, 2013)	Examining enhancing shared understanding in collaborative online shopping using an experimental method varying the types of shared navigation that influence decision quality and the intention to revisit the store.	Intentions to revisit store	Media synchronicity theory	IS conference
(Yue et al., 2014)	Experimental eye-tracking study exploring the influence of various co-navigation treatments on collaborative online shopping conducted by co-shopper dyads. Looked at coordination, concentration, and comprehension.	Coordination, concentration, and comprehension	Portions of multiple theories	ACM conference
(Zhai and Zhang, 2014)	Survey explaining the factors that encourage Chinese consumers to adopt collaborative shopping. Usefulness, perceived ease of use, subjective norms, word-of-mouth, perceived low-price, and perceived playfulness positively influence purchase intentions.	Purchase intentions	Technology acceptance model	Non-IS conference
(Zhu et al., 2010)	Experimental study exploring the effects of manipulations of navigation support and communication support on collaborative shopping.	Coordination and social presence	Common ground theory; media richness theory	IS Journal

ONLINE APPENDIX B. MODEL CONSTRUCT DEFINITIONS AND MEASUREMENT ITEMS

Construct Definition	Measurement Items	Sources
Online co-presence is the extent to which an online medium naturally and comfortably facilitates users experiencing others as personable and present.	CP1 The interaction with my shopping partner was personal. CP2 I felt comfortable interacting with the other participant in the shopping experience. CP3 I felt that the interaction with the other participant was close. CP4 I felt comfortable conversing through the live chat.	Adapted from Gunawardena and Zittle (1997), Short et al. (1976)
Collaboration usefulness is the extent to which a user finds the collaboration experience helpful and productive in achieving his/her task.	US1 I found the collaboration useful for achieving the tasks. US2 Using the collaboration increased the chances of achieving the task solutions. US3 Using the collaboration helped me accomplish the tasks more quickly. US4 Using the collaboration increased my productivity.	Adapted from the usefulness measure by Venkatesh and Davis (2000)
Endurability is the extent to which system users find the experience worthwhile and successful and thus would recommend it to others.	EN1 Shopping on this website was worthwhile. EN2 I consider my shopping experience a success. EN3 My shopping experience was rewarding. EN4 I would recommend shopping on this website to my friends and family.	O'Brien and Toms (2010)
Novelty refers to unexpected or surprising elements or features that arouse interest and curiosity.	NO1 I continued to shop on this website out of curiosity. NO2 The content of the shopping website triggered my curiosity. NO3 I felt interested in my shopping task.	O'Brien and Toms (2010)
Focused attention is a psychological state of mind with a concentration of mental activity that leads to forgetting one's surroundings.	FA1 I forgot about my immediate surroundings while shopping on this website. FA2 I was so involved in my shopping task that I lost track of time. FA3 When I was shopping, I lost track of the world around me. FA4 The time I spent shopping just slipped away.	O'Brien and Toms (2010)
Felt involvement is a state of psychological identification with some object that leads to being drawn into a task or the experience of enjoyment.	IN1 I was really drawn into my shopping task. IN2 I felt involved in this shopping task. IN3 This shopping experience was fun.	O'Brien and Toms (2010)
Aesthetics is the degree to which the visual appearance of the interface is pleasing and attractive.	AE1 This shopping website was attractive. AE2 This shopping website was aesthetically appealing. AE3 The shopping website was visually pleasing.	O'Brien and Toms (2010)
Perceived usability is the degree to which a system is easy to use, is clear, and is not frustrating.	*PU1 I felt frustrated while visiting this shopping website. *PU2 I found this shopping website confusing to use. *PU3 I felt annoyed while visiting this shopping website. *PU4 This shopping experience was demanding.	O'Brien and Toms (2010) *Reversed scaled.

ONLINE APPENDIX C: ADDITIONAL ANALYSIS DETAILS AND SUPPORT

C.1 Factorial Validity

Factorial validity is established by establishing both *convergent validity*[iv] and *discriminant validity*[v], two highly interrelated concepts that must coexist. To establish the factorial validity of our latent constructs, we used two common techniques for establishing convergent validity and two common techniques for establishing discriminant validity.

First, we examined the outer model loadings, summarized in Table C1. Convergent validity is shown when the *t*-values of the outer model loadings are significant, which was the case. However, we dropped one usability item because its loading was below 0.500. Second, we correlated the latent variable scores against the indicators as a form of factor loadings, and then examined the indicator loadings and cross-loadings to establish convergent validity (see Table C2). Although this approach is typically used to establish discriminant validity, convergent validity and discriminant validity are interdependent and help establish each other (Straub et al., 2004). Thus, convergent validity is also established when each loading for a latent variable is substantially higher than those for other latent variables, which was true in every case, except for two questionable items that were dropped (EN2 and IN3).

Second, we examined the square roots of the average variance extracted (AVE) scores against the correlations of the latent variables. The standard here is that the square root of the AVE for any given construct (latent variable) should be higher than any of the correlations involving the construct (Fornell and Larcker, 1981, Staples et al., 1999). The numbers are shown in the diagonal for constructs (bolded and underlined). These are shown in the measurement model statistics in Table 2 (in the main text). Strong discriminant validity was shown for all latent constructs.

C.2 Reliability

Reliability refers to the degree to which a scale yields consistent and stable measures through time (Straub, 1989). As a product of our rigorous pre-analysis, all of our reflective subconstructs exhibited high levels of reliability. To establish reliability, PLS computes a composite reliability score as part of its integrated model analysis. This score is a more accurate measurement of reliability than Cronbach's α because it does not assume the loadings or error terms of the items to be equal; nonetheless, we included Cronbach's α as a conservative point of comparison. Table 3 (in the main text) indicates strong reliability either way.

C.3. Checking for Multicollinearity

Another key threat to check for with SEM is the potential threat of multicollinearity. We followed the latest standards in checking for this with all construct items. Most VIFs were very low, whereas the highest was still within a reasonable range (< 10.0). More stringent standards are often adopted for PLS models that contain formative measurement, which our model did not use. Refer again to Table 3.

C.4. Summary of Pre-Analysis Validation

Our pre-analyses showed that our data exhibited strong factorial validity of the constructs, little multicollinearity, and strong reliability, and lacked CMB. In summary, the results of our validation procedures revealed that our model data met or exceeded the rigorous validation standards expected in PLS-based analysis (Lowry and Gaskin, 2014, Peng and Lai, 2012, Diamantopoulos and Siguaw, 2006, Petter et al., 2007, Cenfetelli and Bassellier, 2009).

C.5. Establishing Lack of Common-Method Bias

Our research was designed a priori so that common-method bias (CMB) (also known as mono-method bias) would likely not result in our study, following the leading literature on the subject (Podsakoff et al., 2003, Bagozzi, 2011, MacKenzie and Podsakoff, 2012). For example, the items were randomized for the respondents, the respondents were given experimental manipulations that exposed them to difficult levels of the phenomenon, our survey was very short and clearly designed (also reducing instrumentation fatigue), not all the scaling was in the

same direction, and the respondents in the control group did not complete items on co-presence and collaboration usefulness. Importantly, experiments like ours are not subject to CMB, due to our stand-alone surveys. Nonetheless, we tested for CMB to establish that it was not a likely negative factor in the data remaining for our analysis.

Pivotally, if CMB exists, the constructs of the model will be highly correlated. Thus, the key approach that we used was simply to examine a correlation matrix of the constructs and determine whether any of the correlations were above 0.90, which is evidence that CMB may exist (Pavlou et al., 2007). These correlations are observed in the measurement model statistics in Table 2 (in the main text)—all of which are well below the 0.90 threshold. Hence, given our experimental design and controls against CMB with these correlations, we have no reason to believe CMB influenced our study.

Table C1. Outer Model Weights to Establish Convergent Validity

Latent construct	**Items**	**Outer weight**	***t*-values**
Aesthetics	AE1	0.940	140.04***
	AE2	0.963	200.71***
	AE3	0.940	115.53***
Endurability	EN1	0.869	63.12***
	EN2	0.785	40.65***
	EN3	0.864	56.12***
	EN4	0.881	83.96***
Focused attention	FA1	0.800	37.37***
	FA2	0.819	42.36***
	FA3	0.876	65.85***
	FA4	0.874	54.78***
Involvement	IN1	0.893	83.27***
	IN2	0.850	72.11***
	IN3	0.894	114.57***
Novelty	NO1	0.802	39.60***
	NO2	0.887	91.24***
	NO3	0.810	43.35***
Perceived usability	PU1	0.831	35.23***
	PU2	0.802	39.09***
	PU3	0.896	73.51***
	PU4	0.356	(d) 4.08***
Co-presence	CP1	0.786	39.13***
	CP2	0.853	47.00***
	CP3	0.868	70.81***
	CP4	0.875	61.61***
Collaboration usefulness	USE1	0.928	107.42***
	USE2	0.903	75.65***
	USE3	0.932	115.56***
	USE4	0.888	51.65***

***$p < 0.001$, (d) = dropped to improve convergent validity

Table C2. Correlations of Latent Variables against their Indicators to Indicate Factor Loadings

Items	Aesthetics	Endur.	Attention	Involvement	Novelty	CU	CP	Usability
AE1	0.940	0.657	0.357	0.642	0.565	-0.510	0.416	0.390
AE2	0.963	0.664	0.373	0.639	0.586	-0.515	0.396	0.428
AE3	0.940	0.678	0.393	0.670	0.644	-0.565	0.432	0.521
EN1	0.610	0.869	0.496	0.730	0.737	-0.465	0.606	0.665
EN2(3)	0.508	(d)0.785	0.353	0.686	0.561	-0.586	0.618	0.514
EN3	0.603	0.864	0.521	0.747	0.760	-0.443	0.649	0.636
EN4	0.666	0.881	0.495	0.768	0.704	-0.558	0.643	0.663
FA1	0.364	0.410	0.800	0.454	0.434	-0.331	0.424	0.333
FA2	0.307	0.478	0.819	0.550	0.515	-0.284	0.455	0.495
FA3	0.364	0.504	0.876	0.475	0.492	-0.300	0.448	0.446
FA4	0.304	0.459	0.874	0.513	0.502	-0.291	0.451	0.458
IN1	0.613	0.712	0.524	0.893	0.735	-0.487	0.613	0.557
IN2	0.524	0.709	0.477	0.850	0.701	-0.457	0.620	0.497
IN3(d)	0.665	(d)0.840	0.558	0.894	0.748	-0.645	(d)0.718	0.720
NO1	0.450	0.608	0.461	0.554	0.802	-0.192	0.419	0.615
NO2	0.582	0.732	0.508	0.699	0.887	-0.390	0.584	0.614
NO3	0.544	0.694	0.478	0.824	0.810	-0.506	0.581	0.477
PU1	-0.400	-0.436	-0.295	-0.441	-0.284	0.829	-0.397	-0.331
PU2	-0.424	-0.442	-0.264	-0.485	-0.324	0.802	-0.332	-0.200
PU3	-0.567	-0.615	-0.337	-0.595	-0.462	0.899	-0.537	-0.368
CP1	0.300	0.530	0.581	0.559	0.547	-0.248	0.786	0.601
CP2	0.448	0.671	0.325	0.630	0.488	-0.596	0.853	0.535
CP3	0.374	0.639	0.499	0.662	0.596	-0.379	0.868	0.703
CP4	0.362	0.663	0.373	0.661	0.509	-0.522	0.875	0.573
USE1	0.448	0.702	0.478	0.654	0.632	-0.370	0.693	0.928
USE2	0.458	0.613	0.439	0.601	0.612	-0.338	0.597	0.903
USE3	0.399	0.672	0.509	0.624	0.648	-0.311	0.682	0.932
USE4	0.421	0.676	0.461	0.603	0.603	-0.302	0.640	0.888

(d) = dropped to improve convergent and discriminant validity

Table C3. Effect Sizes of Tested Model Paths

Tested path	r (effect size)[vi] of comparison	Effect size Interpretation
Model A: (a) Chat only and (b) co-browsing + chat		
H1. Co-presence → novelty	0.620	Large
H2. Co-presence → focused attention	0.529	Large
H3. Co-presence → felt involvement	0.675	Large
H4. Co-presence → endurability	0.709	Very large
H5. Novelty → focused attention	0.573	Large
H6. Focused attention → felt involvement	0.551	Large
H7. Felt involvement → endurability	0.761	Very large
H8a. Website aesthetics → endurability	0.702	Very large
H8b: Website usability → endurability	0.539	Large
H8c. Collaboration usefulness → endurability	0.733	Very large
Control: age → endurability	0.087	Negligible
Control: gender → endurability	-0.094	Negligible
Control: online shopping experience → endurability	0.214	Small
Model B: Control (no chat and no co-browsing + chat)		
H5. Novelty → focused attention	0.559	Large
H6. Focused attention → felt involvement	0.547	Large
H7. Felt involvement → endurability	0.712	Very large
H8a. Website aesthetics → endurability	0.663	Large
H8b: Website usability → endurability	0.526	Large
Control: age → endurability	0.165	Negligible
Control: gender → endurability	0.189	Negligible
Control: online shopping experience → endurability	0.091	Negligible
Model C: Chat only (no co-browsing + chat treatment)		
H1. Co-presence → novelty	0.570	Large
H2. Co-presence → focused attention	0.525	Large
H3. Co-presence → felt involvement	0.676	Large
H4. Co-presence → endurability	0.609	Large
H5. Novelty → focused attention	0.590	Large
H6. Focused attention → felt involvement	0.612	Large
H7. Felt involvement → endurability	0.798	Very large
H8a. Website aesthetics → endurability	0.752	Very large
H8b: Website usability → endurability	0.368	Medium
H8c. Collaboration usefulness → endurability	0.741	Very large
Control: age → endurability	0.150	Negligible
Control: gender → endurability	-0.025	Negligible
Control: online shopping experience → endurability	0.251	Small
Model D: Chat + co-browsing (no chat-only treatment)		
H1. Co-presence → novelty	0.662	Large
H2. Co-presence → focused attention	0.535	Large
H3. Co-presence → felt involvement	0.668	Large
H4. Co-presence → endurability	0.787	Very large
H5. Novelty → focused attention	0.562	Large
H6. Focused attention → felt involvement	0.441	Large
H7. Felt involvement → endurability	0.712	Very large
H8a. Website aesthetics → endurability	0.642	Large
H8b: Website usability → endurability	0.661	Large
H8c. Collaboration usefulness → endurability	0.715	Very large
Control: age → endurability	-0.043	Negligible
Control: gender → endurability	-0.200	Small
Control: online shopping experience → endurability	0.185	Negligible

Table C4. Details of PLS MGA

Path	Group 1 β	Group 1 SE	Group 2 β	Group 2 SE	Equality of SEs?	*t*-value	Results of Comparisons
Group 1 = model A (chat + co-browsing treatment; n = 55); Group 2 = model B (control; n = 120)							
H5. NO → FA	0.365	0.044	0.561	0.028	No	3.79***	Control > model A
H6. FA → FI	0.109	0.039	0.555	0.030	No	9.14***	Control > model A
H7. FI → EN	0.183	0.023	0.462	0.038	No	6.34***	Control > model A
H8a Aesthetics	0.301	0.026	0.363	0.045	No	1.20(n/s)	No difference
H8b. Usability	0.121	0.031	0.072	0.042	No	0.95(n/s)	No difference
age → EN	-0.147	0.021	0.011	0.024	Yes	5.02***	Older people (-) model A
gender → EN	-0.144	0.020	0.110	0.029	No	7.28***	Men model A; women control
shopping → EN	0.139	0.020	-0.020	0.027	No	4.78***	Model A > control
Group 1 = model C (chat only; n = 59); Group 2 = model B (control; n = 120)							
H5. NO → FA	0.446	0.039	0.561	0.028	No	2.42*	Control > model C
H6. FA → FI	0.361	0.042	0.555	0.030	No	3.78***	Control > model C
H7. FI → EN	0.334	0.045	0.462	0.038	Yes	2.18*	Control > model C
H8a Aesthetics	0.260	0.034	0.363	0.045	No	1.84(n/s)	No difference
H8b. Usability	0.026	0.025	0.072	0.042	No	0.95(n/s)	No difference
age → EN	-0.030	0.024	0.011	0.024	Yes	1.22(n/s)	No difference
gender → EN	-0.062	0.031	0.110	0.029	Yes	4.07***	Men model C; women control
shopping → EN	0.152	0.027	-0.020	0.027	Yes	4.54***	Model C > control
Group 1 = model C (chat only; n = 59); Group 2 = model D (chat + co-browsing; n = 55)							
H1. CP → NO	0.579	0.025	0.687	0.028	Yes	2.91**	Model D > model C
H2. CP → FA	0.276	0.048	0.291	0.038	No	0.25(n/s)	No difference
H3. CP → FI	0.484	0.036	0.611	0.043	Yes	2.30*	Model D > model C
H4. CP → EN	-0.055	0.032	0.363	0.046	Yes	7.53***	Model D > model C
H5. NO → FA	0.446	0.039	0.365	0.044	Yes	1.39(n/s)	No difference
H6. FA → FI	0.361	0.042	0.109	0.039	Yes	4.42***	Model C > model D
H7. FI → EN	0.334	0.045	0.183	0.023	No	3.01**	Model C > model D
H8a. aesthetics	0.260	0.034	0.301	0.026	No	0.97(n/s)	No difference
H8b. usability	0.026	0.025	0.121	0.031	Yes	2.42*	Model D > model C
H8c. usefulness	0.441	0.037	0.123	0.035	Yes	6.28***	Model C > model D
age → EN	-0.030	0.024	-0.147	0.021	Yes	3.68***	Older people (-) model D more
gender → EN	-0.062	0.031	-0.144	0.020	No	2.24*	Women (-) model D more
shopping → EN	0.152	0.027	0.139	0.020	No	0.39(n/s)	No difference

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, n/s = not significant; a more conservative formula for *t* was used when the standard errors (SEs) were statistically shown to not be the same, as per Hair et al. (2013).

[i] Aesthetic theory describes the importance of the visual appearance, design, harmony, and symmetry of the interface design Beardsley, MC (1982), *The Aesthetic Point of View: Selected Essays*, Cornell University Press, Ithaca, NY.. The needs of users are easier to match if the design is appealing. It has been identified that higher motivation, satisfaction, and frequency of using the system occurs when the users are playing Atkinson, M & Kydd, C (1997), Individual characteristics associated with World Wide Web use: An empirical study of playfulness and motivation, *ACM SIGMIS Database*, 28(2), pp. 53-62.. Hence, O'brien, HL & Toms, EG (2008), What is user engagement? A conceptual framework for defining user engagement with technology, *Journal of the Association for Information Science and Technology*, 59(6), pp. 938-955. concluded that aesthetics can foster engagement.

[ii] Information interaction describes the communication between users and the computer interface. Such interaction through an interface can have positive effects on users and can improve enjoyment in using the system or the desire to explore more aspects of it Shneiderman, B (1997), Direct manipulation for comprehensible, predictable and controllable user interfaces. 2nd International Conference on Intelligent User Interfaces, January 6-9 1997 Orlando, FL. ACM, 33-39.. Thus, O'brien, HL & Toms, EG (2008), What is user engagement? A conceptual framework for defining user engagement with technology, *Journal of the Association for Information Science and Technology*, 59(6), pp. 938-955. concluded that such interaction can foster engagement.

[iii] Playing is defined as an activity in which people are active, creative and able to learn. They try to satisfy their psychological and social needs and are confronted with aspects such as competition and collaboration Rieber, LP (1996), Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games, *Educational Technology Research and Development*, 44(2), pp. 43-58.. Therefore, O'brien, HL & Toms, EG (2008), What is user engagement? A conceptual framework for defining user engagement with technology, *Journal of the Association for Information Science and Technology*, 59(6), pp. 938-955. tied playing to engagement.

[iv] *Convergent validity* is the basic idea that measurement items that should be related are related. It is established "when items thought to reflect a construct converge, or show significant, high correlations with one another, particularly when compared to the convergence of items relevant to other constructs, irrespective of method" Straub, DW, Boudreau, MC & Gefen, D (2004), Validation guidelines for IS positivist research, *Communications of the Association for Information Systems*, 14(1), pp. 380-426..

[v] *Discriminant validity* is the idea that items that should not be related are, in fact, not related. It can be established when items thought to diverge show insignificant, low correlations with one another, particularly when compared with items in other constructs ibid..

[vi] Based on Cohen, effect sizes based on *r* are interpreted as follows: $r > 0.70$ = very large; $r \geq 0.40 < 0.69$ = large; $r \geq 0.30 < 0.39$ = medium; $r \geq 0.20 < 0.29$ = small; $r < 0.19 > 0.01$ = negligible.