

# ENHANCING SHARED UNDERSTANDING IN COLLABORATIVE ONLINE SHOPPING

*Completed Research Paper*

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## Abstract

*This study explores the emerging phenomenon of collaborative online shopping by comparing three navigation support designs: separate navigation with location cue, split screen navigation, and tightly-bonded shared navigation. The impacts of the three navigation support designs on collaborative customers' actual and perceived shared understanding were investigated in a laboratory experiment. The moderating effect of shopping group structure was also examined. The experimental results show that (1) split screen navigation leads to more actual shared understanding than separate navigation with location cue; (2) tightly-bonded shared navigation leads to less perceived shared understanding than split screen navigation; (3) in terms of actual shared understanding, the superiority of split screen navigation over tightly-bonded shared navigation is less prominent for customers in co-buyers structure than for those in buy/advisor structure. The results also indicate that perceived shared understanding influences the perceived decision quality, which further affects customers' intentions to revisit the online store.*

**Keywords:** Collaborative online shopping, navigation support, group structure, shared understanding

## **Introduction**

Shopping is generally a social behavior, frequently done when one is accompanied by friends or family (Evans et al. 1996). While prior research suggested that instant social interaction and communication is one of the prominent motivations for people to shop (Puglia et al. 2000; Tauber 1972; Westbrook and Black 1985), most of the e-commerce websites are designed for solitary use and online customers could not easily interact with their close ones in real time.

As a new paradigm of e-commerce, collaborative online shopping or co-shopping (COS), defined by Zhu et al. (2010) as “the activity in which a customer shops at an online store concurrently with one or more remotely located shopping partners”, would have the potential to dramatically facilitate instant social interaction for online customers. Specifically, COS provides collaboration support for shopping companions to share and exchange their opinions about products. It fulfills customers’ needs to shop with close ones in a social and collaborative environment, rather than in isolation (Goswami et al. 2007; O’Hara and Perry 2001). Through social interaction and communication, customers would feel affiliated with and supported by their shopping companions (Kiecker and Hartman 1993, 1994). Recently, the trend for customers to collaboratively shop online is increasingly common in everyday life (Huang et al. 2012). For example, two remotely located individuals (friends or family members in different places) may buy a product or service online together for their mutual friend as a gift.

Since one of the most salient aspects of COS is the exchange of opinions or ideas about products among collaborative customers, the needs to support effective communication and increase the likelihood of shared understanding are particularly relevant to COS. Thus, it is imperative to design appropriate navigation mechanisms that could help customers navigate to the same product information for discussion (Zhu et al. 2010). However, in spite of the evident demand for customer collaboration in e-commerce, COS is not well supported by current systems (Benbasat 2010). Collaborative customers in undertaking COS have to use their web browsers independent of each other. Consequently, limited contextual information about the focal products could be transmitted between collaborative customers.

Research has shown that when remotely located collaborators don’t have enough contextual information about each other, their communication would be ineffective (Cramton 2001; Dabbish and Kraut 2008; Olson and Olson 2000) and, in turn, impedimental to the collaborative task performance. Therefore, the inherent limitation of the solitary-use websites to present contextual information likely leads to collaborative customers being less knowledgeable about each other’s opinions about the products that are of interest to them, and less capable in coordinating their shopping process.

To alleviate this concern, prior research has investigated tightly-bonded shared navigation support as a potential solution to create a referential context that both customers could access for product discussion (Zhu et al. 2010). Although tightly-bonded shared navigation support enables both collaborative customers to synchronize their browsing paces so that one can always know what the other person is looking at, it leads to unexpected uncoupling problems when the two collaborators do not well coordinate with one another. Benbasat (2010) suggested that appropriate navigation designs are desired to improve customers COS experience.

As previous e-commerce research and practice mainly focus on customers’ individual shopping behavior, the theoretical understanding towards customers’ behavior in COS is rather limited, and the practical guidelines for systems designers to develop appropriate COS technologies are rare. To address this research gap and further enhance collaborative customers’ shopping experience, this study proposes two new types of navigation support: separate navigation with location cue and split screen navigation. In the separate navigation with location cue condition, users could separately browse the web page in their own browsers and at the same time they are provided with a clickable visual location indicator, which displays their partner’s real-time location information. The users can navigate to the web page that his/her partner is viewing by clicking on the location cue. Split screen navigation divides the browser into two separate screens, with one screen controlled by one user and the other screen instantly displaying the current web page his/her partner is viewing.

The present paper attempts to empirically investigate the effects of the three navigation support designs (i.e., separate navigation with location cue, split screen navigation, and tightly-bonded shared navigation) on collaborative customers’ shared understanding. Two indicators of shared understanding performance

are evaluated: actual shared understanding and perceived shared understanding. To measure customers' actual and perceived shared understanding concurrently in this study is necessary, since customers' self-reported perception towards the effectiveness of specific technology may not be the same as its actual effectiveness (Hoch 2002; Jiang and Benbasat 2007). The inclusion of actual as well as perceived shared understanding would provide a more comprehensive view about the effects of various navigation support designs.

Another purpose of this study is to investigate the moderating effects of shopping group structure. Group structure is defined as an indication of the role combination among group members (Stewart and Barrick 2000). This objective is motivated by the observation that friends or family shopping together may have different role combinations. Two commonly observed forms of group structure are (1) 'co-buyers' structure, i.e. all collaborative customers are responsible for the decision making (e.g. shopping companions buy a birthday gift together for their mutual friend), and (2) 'buyer/advisor' structure, with which only one customer (the buyer) is responsible for the purchase decision making, and other customers (the advisors) only provide suggestions or give self-opinions to the buyer for his/her consideration (e.g. an individual, who wants to shop for clothes, asks his/her friends to accompany him/her and give suggestions). It has been found that group structure influences people's perception and usage of enterprise systems in organization context (Sasidharan et al 2012). Although there is such a possibility that group structure may also influence the effectiveness of various navigation support designs in online shopping context, it has not yet been examined and empirically investigated. Therefore, it is unknown whether different navigation support designs work similarly for shopping companions with different group structure.

This paper is organized as follows. The next section reviews previous literature and theoretical foundations, followed by hypotheses development. After that we demonstrate the research method and report the analysis results. The last section concludes with discussions of the implications and future research directions.

## **Review of Theoretical Foundations**

### ***Common Ground and Grounding Cost***

Considering collaborative online shopping as a collaboration task, we argue that in order to make it an efficient and pleasant experience, shopping companions have to establish common ground between each other, since effective collaboration requires collaborators to build shared understanding of the work, the situation, and the information shared among them (Clark and Brennan 1991; Dourish and Bellotti 1992; Olson and Olson 2000).

Common ground refers to the knowledge held in common by the collaborators, combined with their awareness that they have the knowledge in common (Clark and Brennan 1991; Olson and Olson 2000; Zhu et al. 2010). Researchers have found that common ground among conversational participants has a primary role in defining the domain of interpretation (Clark 1992), and collaborators could have a shared referential base for discussion (Carroll et al. 2003). Common ground exerts positive effect on reference resolution and improves the communication efficiency (Hanna et al. 2003). Moreover, findings in Gutwin and Greenberg (2002) suggested that helping people to stay aware of others improves the system's usability.

However, the benefit of common ground doesn't come without any cost. People have to devote efforts to deal with the potential intra-group conflict when trying to establish their common ground. Clark and Brennan (1991) classified these efforts as interaction cost, i.e. the efforts devoted to deal with the possible conflict and interference emerged across collaborators to smooth the information exchange and discussion process. The preferences for grounding media is formed by considering both the costs associated with each media and the benefits it could provide. For example, in a group decision making context, group members sometimes want to get their partners' full attention when sharing information and opinions, yet they wish to avoid any interruption from their partners while individually processing information. Therefore, grounding technique is necessary to fulfill both the need of individual information processing and the need of group interaction, so that the decision making could be smoothly made (Dennis et al. 2001).

Accordingly, we contend that for collaborative customers in undertaking COS, the preference for various

navigation support technologies depends on whether the supporting media best serves the group members' purpose, i.e. facilitate the purpose to share and discuss product information, as well as help to avoid interrupting while customers involve in the individual information processing stage. Appropriate navigation support technologies need to facilitate the achievement of common ground to guarantee the shared understanding across shopping companions, and also to alleviate customers' efforts to achieve that.

### ***Media Synchronicity Theory***

Media synchronicity theory (MST) considers communication as a process in which participants create and share information with one another in order to reach shared understanding (Dennis et al. 2008; Dennis and Valacich 1999). The theory postulates that communication can be classified into two fundamental processes, i.e. conveyance process and convergence process. Shared understanding will be improved if the synchronicity of a given media appropriately matches the synchronicity that a communication process desires (Dennis et al 2008; Dennis and Valacich 1999). Conveyance and convergence process are distinct from each other in terms of the characteristics of the information being transmitted (new/raw information or preprocessed information). On one hand, conveyance process is the transmission of a diversity of new information by the sender and the processing of that target information by the receiver to create and revise the mental model of the situation (Dennis et al. 2008). On the other hand, convergence process is the process of mutually negotiating the meaning of the information after the processing of that information, i.e. it is the process to discuss each individual's interpretation of the processed information.

The theory suggests that for conveyance processes, use of media low in synchronicity will lead to better communication performance, and for convergence processes, use of media high in synchronicity will lead to better communication performance. The reasons are: during conveyance process, people often require time to engage in substantial information processing activities to digest the new information, in which case people don't need to work at the same time. Media low in synchronicity grants the required time for the complete processing of new information, whereas media high in synchronicity may harm the comprehensive apprehension of the new information since it generates expectations of rapid interaction and interfere with individual's deliberation process (Weick and Meader 1993).

Nonetheless, during convergence process, people would discuss each individual's information interpretation, and they often need rapid and frequent transmission of small quantities of preprocessed information. Media high in synchronicity could better support such needs through the increased level of interaction (Graetz et al. 1998). Yet, media low in synchronicity may increase delays for frequent message exchange and impede the rapid development of shared understanding between people. For example, Murthy and Kerr (2003) found that media providing high synchronicity outperform media in low synchronicity when the communication process goal involved convergence.

In collaborative online shopping context, shopping companions communicate with each other to exchange information and opinions during the shopping experience. Thus, navigation support designs should facilitate conveyance and convergence process properly in order to support effective communication and increase the likelihood of shared understanding among collaborative customers.

## **Hypotheses Development**

### ***Independent and Dependent Variables***

In this study, we investigate the effects of three types of navigation support technologies (i.e., separate navigation with location cue, split screen navigation, and tightly-bonded shared navigation) on collaborative customers' shared understanding, and explore the moderating role of group structure.

Specifically, separate navigation with location cue allows users to separately browse the web page in their own browsers and at the same time presents a clickable visual location indicator, which displays the partner's real-time location information. Customers could click on the location cue indicator to navigate to the web page that his/her partner is looking at. Split screen navigation divides the browser into two equal-sized screens, with one screen (personal screen) controlled by the customer and the other screen (shared screen) instantly reflecting the current web page his/her partner is viewing. It enables customers to

monitor their partners' web page and navigation actions on the shared screen while navigating independently on the personal screen. Tightly-bonded shared navigation binds collaborative customers to a shared web browser and provides a completely synchronized view of the same web contents. Customers would navigate on the website at the same pace, and the navigation control power is equally distributed between them.

There are two main reasons for the present study to propose separate navigation with location cue and split screen navigation as the two new navigation support designs: (1) while maintaining awareness of collaborators, individuals also demand flexible means for their own interacting with the website (Gutwin and Greenberg 1998; Greenberg 1998); (2) awareness could be provided from two different levels, i.e. abstract or full awareness (Dabbish and Kraut 2008). Accordingly, both separate navigation with location cue and split screen navigation allow collaborative customers to interact with the website in their own way, with the former navigation support providing abstract awareness of partners' web page through the location cue indicator and the later one providing full awareness through the shared screen.

Two major dependent variables have been used to measure customers' shared understanding performance from two perspectives: actual and perceived. Actual shared understanding refers to the extent to which customers actually understand their shopping companions' opinions about the product. Perceived shared understanding is defined as customers' perceptions of the extent to which companions within the shopping group have the same understanding towards the products. It is important to assess the effects of the three types of navigation support on perceptual construct since perceptions are key influences on intended behavior. Moreover, Goodhue et al. (2000) and Jiang and Benbasat (2007) suggested that users' self reporting of their performance of using information systems is sometimes a poor surrogate for their objective performance. Thus it is necessary to also include the objective measurement of shared understanding.

Shared understanding has been considered to be an important factor that may influence group decision quality. For example, Cramton (2001) and Huber and Lewis (2010) suggested that decision quality hinges on shared understanding of distributed information between group members. Therefore, it is reasonable to propose actual and perceived shared understanding as the factors influencing perceived decision quality in this study.

### ***Split Screen Navigation vs. Separate Navigation with Location Cue***

Being able to stay aware of others plays an important role in the fluidity and naturalness of collaboration. Supporting awareness of others alleviates the barriers of remote collaboration (Gutwin and Greenberg 2002). Although both location cue navigation and split screen navigation are supposed to enable shopping companions to get aware of the web page their partners are viewing, their effectiveness to facilitate the establishment of shared understanding is different. Location cue navigation provides customers with abstract information of the product being viewed by their partner via the location indicator. In contrast, split screen navigation enables both customers to have a full view of their partners' screen contents (via the shared screen), thus providing more common ground than location cue navigation for customers to easily develop actual shared understanding.

Meanwhile, customers may perceive that the use of split screen instead of location cue navigation can enhance shared understanding. The reason is that, since detailed product information is not evidently presented with abstract location cue in location cue navigation, customers cannot immediately initiate the discussion based on what he/she sees in the abstract location cue. They have to take more time and effort to access the web page and locate the target information, in which case less cognitive resource would be available for information processing. Split screen navigation permits higher level of shared focus than location cue navigation by presenting a full view of the product information in the shared screen. With the increased level of common ground, co-shoppers may exchange opinions and converge to a shared interpretation of the target information more efficiently by avoiding delays and cognitive efforts.

Hence, we posit that

*H1a: Split screen navigation leads to higher level of actual shared understanding than separate navigation with location cue.*

*H1b: Split screen navigation leads to higher level of perceived shared understanding than separate*

navigation with location cue.

### **Tightly-Bonded Shared Navigation vs. Split Screen Navigation**

The potential intra-group process conflict concerns issues of resource allocation during collaborative work. People may get interrupted from the task at hand by the behavior of the collaborators (Hill and Gutwin 2004). The interaction cost of grounding has demonstrated a persistent negative influence on collaboration outcomes, as group and individual efforts are expended on resolving the conflict and adjusting the collective information processing activity (Behfar et al. 2011; Greer and Jehn 2007; Jehn 1997).

From grounding cost perspective, intra-group process conflict (Jehn 1997; Jehn et al., 1999; Zou and Stormont 2005) may occur when considering control power allocation and attention focus during the shopping process with tightly-bonded shared navigation (Zhu et al. 2010). For example, since collaborative customers are strictly synchronized, one's control over his own preferred way of navigation may be interrupted by his partners' unannounced act of scrolling on the web page. Compared to tightly-bonded shared navigation, split screen navigation generates less interaction cost for collaborative customers by allowing people to view the same Web page contents through the shared screen while having a full control over his preferred way of navigation in the personal screen.

Moreover, according to media synchronicity theory, people must establish individual understanding of the target information via conveyance process before the development of shared understanding (Dennis et al. 2008; Dennis and Valacich 1999). In tightly-bonded shared navigation, people may easily get confused by a sudden navigation initiated by his partner, thus the individual information processing is impaired. It is reasonable to argue that when customers perceive an incomplete individual understanding of the product information, they would experience low perceived shared understanding. Contrarily, in split screen navigation condition, customers' individual understanding would not be that easily influenced by their partners' behavior and the development of shared understanding would be improved based on the well established individual understanding.

Therefore, we propose the following hypothesis:

*H2a: Split screen navigation leads to higher level of actual shared understanding than tightly-bonded shared navigation.*

*H2b: Split screen navigation leads to higher level of perceived shared understanding than tightly-bonded shared navigation.*

### **Separate Navigation with Location Cue vs. Tightly-Bonded Shared Navigation**

Clark and Brennan (1991) suggested that the preferences for grounding media is formed by weighing both the costs associated with each media and the benefits it could provide. Although tightly-bonded shared navigation provides more common ground than location cue navigation, its salient interaction grounding cost counteracts these benefits.

Tightly-bonded shared navigation strictly tied collaborative customers together, whereas it is quite common that conflicts may occur when collaborative customers follow divergent product search paths at times (Zhu et al. 2010). Compared to location cue navigation, tightly-bonded shared navigation is less likely to facilitate customers' individual interpretation of product information. Media synchronicity theory implies that when individual information process in conveyance process is impaired, the development of information understanding would be damaged and people's premature actions would be encouraged (Weick and Meader 1993). Hence, collaborative customers would have less positive feeling during the product discussion and misunderstanding between customers would be more likely to happen in tightly-bonded shared navigation condition. Consequently, collaborative customers would perceive that shared understanding is not as well established as that in location cue navigation condition.

Therefore, we propose the following hypotheses:

*H3a: Separate navigation with location cue leads to higher level of actual shared understanding than tightly-bonded shared navigation.*

*H3b: Separate navigation with location cue leads to higher level of perceived shared understanding than tightly-bonded shared navigation.*

### **Moderating Effect of Group Structure**

Cognitive tuning theory (Zajonc 1955) suggests people would activate different cognitive structures and apply distinct information processing strategies under different conditions of anticipating dealing with information (Harvey 1976; Mazis 1972). Mazis (1972) indicated that people in transmission tuning (e.g. advisors) may often have a higher accuracy motivation than people in acceptance tuning (e.g. buyers) as they (as friends) usually feel very accountable for the suggestions they provided. It is also possible that advisors strategically spend more time to deeply understand the information and develop a clear suggestion to create a favorable impression. In other words, advisors would have more needs than buyers to focus their attention on understanding and remembering a limited amount of information in order to develop a clear cognitive picture which is easier to pass on to buyers (Mazis 1972). As the processing of the target information to create the mental model is a part of the conveyance process (Dennis et al. 2008), we contend that buyer/advisor structure, compared to co-buyers structure, would encourage collaborative customers to engage more in conveyance process, which may be better supported by low media synchronicity than by high media synchronicity (Dennis et al. 2008).

Unlike buyer/advisor structure, in which the advisor's main task is to convey opinions or suggestions to the buyer for decision making and there's less need to discuss with the buyer to come out with a purchase decision that both parties could accept (Jonas and Frey 2003), co-buyers structure requires both parties to take responsibility to make purchase decision. Thus collaborative customers in co-buyers structure would have more needs than those in buyer/advisor structure to make adequate convergence of the mutual interpretation and negotiate to reach a mutually agreed decision. Consequently, the navigation support with high media synchronicity would be more suitable for co-buyers (than for customers in buyer/advisor structure), as their increased needs to engage in convergence process could be better supported.

According to media synchronicity theory, synchronicity is specifically defined as a state in which actions move at the same rate and exactly together (Random House 1987; Dennis et al. 2008). Tightly-bonded shared navigation is then deemed to have higher synchronicity than split screen navigation and location cue navigation, since shared navigation constrains collaborative customers to synchronize their browsing paces and navigate together at the same time, whereas split screen and location cue navigation would allow customers to browse at separate paces.

Therefore, we posit that

*H4a: In terms of actual shared understanding, the superiority of split screen navigation over tightly-bonded shared navigation will be less prominent for collaborative customers in co-buyers group structure than for those in buyer/advisor group structure.*

*H4b: In terms of actual shared understanding, the superiority of separate navigation with location cue over tightly-bonded shared navigation will be less prominent for collaborative customers in co-buyers group structure than for those in buyer/advisor group structure.*

However, in terms of perceived shared understanding, the moderating effect of group structure may not function. This may be explained by the effect of "illusion of control" (Davis and Kottemann 1994). Davis and Kottemann (1994) suggested that users tend to over-estimate their decision performance simply because they have control over their decision making process. Prior IS research in online shopping context finds support for the existence of this effect (e.g. Jiang and Benbasat 2007). Collaborative customers with shared navigation are deemed to have limited control as they have to compete with their partners for control of the navigation direction. In contrast, customers with separate navigation with location cue and split screen navigation could fully control their search process and freely navigate on the website via their person screens. Applying the effect of "illusion of control" to the context of navigation support, we argue that since separate navigation with location cue and split screen navigation allow customers to control their navigation on the website, the illusion of control would lead customers to consistently over-estimate their shared understanding towards the opinions about products regardless of group structure forms. Hence, we propose the following hypotheses:

*H5a: In terms of perceived shared understanding, the superiority of split screen navigation over tightly-bonded shared navigation will not change significantly when collaborative customers' group structure changes from co-buyers to buyer/advisor.*

*H5b: In terms of perceived shared understanding, the superiority of separate navigation with location cue over tightly-bonded shared navigation will not change significantly when collaborative*

*customers' group structure changes from co-buyers to buyer/advisor.*

### ***Impacts of Shared Understanding***

Perceived decision quality is a subjective indication of how customers perceive their decision to be accurate, correct, precise, and reliable (Mennecke and Valacich 1998; Tan et al. 2010). Since shared understanding helps shopping companions to better collaborate with each other and reach an outcome easily, when more shared understanding is achieved during the collaborative shopping process, customers' feeling and attitude will be enhanced and the confidence toward the purchase decision is increased. When shared understanding is achieved, customers in the same dyad would better acknowledge each other's preferences or opinions towards the products. Hence, it is more likely that customers with increased shared understanding would find the most suitable product than when they misunderstand or don't get clear of each other's ideas or opinions about the alternative products.

Meanwhile, increased shared understanding would enable shopping companions to more efficiently share and discuss product information, and in turn more alternative products could be collectively examined and more precise evaluations of the products could be made. With more shared understanding, shopping companions could involve less effort in dealing with misunderstanding and more effort in the product examination process. Since the purchase decision is made based on the mutual understanding between shopping companions, both shoppers will be satisfied with the final product choice. Therefore,

*H6: Actual shared understanding has a positive relationship with perceived decision quality.*

*H7: Perceived shared understanding has a positive relationship with perceived decision quality.*

Customers' intention to return to the website is a critical success factor for online vendors (Koufaris 2002). One of the ultimate shopping goals of COS is to purchase the most suitable product. Hence, when customers perceive that they have made a good decision and their shopping goal is effectively accomplished, their satisfaction towards the website would be enhanced. The favorable attitudes towards shopping on the website would reinforce the likelihood of customers' return. Therefore,

*H8: Perceived decision quality has a positive relationship with intention to return.*

## **Research Method**

### ***Experimental Design***

The hypotheses proposed in the present study were tested through a laboratory experiment with a 3×2 between-factorial design (i.e., 3 types of navigation support ×2 types of group structure). The three types of navigation support include: (1) separate navigation with location cue, (2) split screen navigation, and (3) tightly-bonded shared navigation. The two types of group structure are: (1) buyer/advisor and (2) co-buyers. In the present study, we focus on shopping group with two persons, which is the most common situation in everyday life.

A total of 240 subjects (120 pairs) were recruited from a major public university campus and randomly assigned to the six treatment conditions. Each person who volunteered was asked to invite a friend to attend the experiment together with him/her, to emulate a real shopping context. Among the 240 subjects, 167 were females. The ages of the participants ranged from 18 to 28, with the average value of 21.6. The academic backgrounds of the participants were diverse, including social science, business, engineering, science, and etc. 226 participants were undergraduate students and the rest were graduate students. 20% of the subjects had known their shopping partners for more than four years, 32% between two and four years, 26% between one and two years, and 22% less than one year. Almost 75% of the subjects had used Internet for more than 10 years, with the average value of 10.8 years.

There was no significant difference across the six experimental conditions in terms of gender, age, past Internet experience, the length of time subjects had known their partners. It is reasonable to conclude that participants' demographics were quite homogeneous across the six conditions.



## **Experimental Procedures**

The two subjects in the same dyad were allocated in two different rooms equipped with computers and monitors of the same type. They were asked to visit a website to book a hotel room collaboratively with the assigned navigation support, as if both of them (co-buyers structure) or only one of them (buyer/giver structure) need(s) to stay in for their/his coming overseas trip. There were two research assistants located in the two experiment rooms respectively. The research assistants monitored the whole experiment process to ensure that the subjects used the navigation support designs properly and played the assigned roles correctly. After finishing the hotel searching and selection, the subjects completed questionnaires and were paid \$12 each as participation reward.

We provided subjects with a benchmark to evaluate the effectiveness of particular navigation support designs based on Helson's (1964) adaptation theory, which posits that people's judgments are based on (1) their past experiences, (2) a context or background, and (3) a stimulus (or treatments). People would make a judgment of the stimulus or treatment provided mainly by basing it on his or her own past experience (Zhu et al. 2010). As suggested by Kim and Benbasat (2006), individual participants are likely to have different past experiences, thus there is no common frame of reference on which to base a judgment. To alleviate the confounding effect of individual participants' past experience, we provided all shopping dyads with a common base condition so that subjects would have a common reference to control for differences in past experiences.

Specifically, before conducting the formal hotel booking task for the trip to Bali Island using particular navigation support designs, participants in the same dyad were requested to conduct a base hotel booking task for the trip to New York City using shared navigation support. The same experimental design was also applied previously in the IS research by Kim and Benbasat (2006) and Zhu et al. (2010).

## **Measurement**

The measurement for perceived shared understanding is adapted from Katz and Te'eni (2007) and Cornelius and Boos (2003). According to the experiment design which is based on Helson's (1964) adaptation theory, the measurement was adjusted to ask participants to compare the particular navigation support design in the treatment condition with the base task navigation support (i.e. shared navigation). The measurement items are listed in the Appendix.

As there is no existent measurement for actual shared understanding, we propose a new measurement based on discrepancy theory (Jiang and Klein 2002). In line with discrepancy analysis in Jiang and Klein (2002), the discrepancy in this study measures how far the understanding about a customer's hotels preference by the shopping partner deviates from this customer's true preference. In particular, actual shared understanding was measured by asking each subject in the same dyad to provide and rank two lists of hotels names, with the first list indicating the top 5 hotels that they would prefer to choose (for buyer) or suggest (for advisor) and the second list showing the top 5 hotels that they think their partners would like to choose or suggest. Then discrepancy analysis was conducted to evaluate the extent to which participants in the same dyad understand each other's opinions.

Specifically, subjects' actual shared understanding was assessed by comparing his second hotel name list with his partners' first hotel name list using the following calculation method: (1) If the same hotel name appears in both lists with the same order, then 5 credits would be granted to this subject with regard to this hotel name; (2) If the same hotel name appears in both lists with different order, then the credits granted to this subject with regard to this hotel name would be "5-(the order difference between the orders of the same hotel name in the two lists)"; (3) If the hotel name only appears in this subject's second list but not in his partner's first list, then 0 credits would be granted to this subject with regard to this hotel name.

The aggregate value would range from 0 to 25, with higher value indicating more shared understanding.

## Data Analysis

### Manipulation Check

A manipulation check for the group structure variable asked subjects to evaluate the following statement, which was based on a seven-point Likert scale (from Strongly Disagree to Strongly Agree): the final decision about which hotel to pick is made by both my friend and me.

Subjects in co-buyers structure, on average, rated 5.56 on the statement. In contrast, subjects in buyer/advisor structure rated 3.02. The value difference is significant ( $t=4.65$ ,  $p<0.001$  respectively). The results suggested that the group structure manipulation was successful.

### Results on Actual Shared Understanding

We first conducted MANOVA analysis on both actual shared understanding and perceived shared understanding. Since the results showed that the treatment effects are significant ( $p<0.05$ ), ANOVAs were further conducted on the two dependent variables separately.

The results of ANOVA on actual shared understanding indicate that there are significant main effects of navigation support and group structure as well as the interaction effect between them (as shown in Table 1). *Post hoc* analysis based on Scheffe test reveals that (see Table 2): (1) split screen navigation leads to higher actual shared understanding than both separate navigation with location cue and tightly-bonded share navigation, thus supporting H1a and H2a; (2) separate navigation with location cue and tightly-bonded shared navigation are not different from each other in terms of actual shared understanding, thus rejecting H3a.

The significant interaction effect implies that the effects of navigation support are moderated by group structures. Therefore, we analyzed the interaction effect in more detail. Specifically, when collaborative customers are in buyer/advisor structure, they have significantly more actual shared understanding when using split screen navigation than when using shared navigation ( $p=0.003$ ). On the contrary, when they are in co-buyers structure, their actual shared understanding doesn't differ significantly between split screen navigation condition and tightly-bonded shared navigation condition ( $p>0.05$ ). Therefore, H4a is supported (see Figure 1). In contrast to our expectation, there is no difference between separate navigation with location cue and tightly-bonded shared navigation for collaborative customers in both co-buyers structure and buyer/advisor structure. Thus, H4b is rejected.

**Table 1. ANOVA Summary: Actual Shared Understanding**

Source	df	Mean square	F	Sig.
Navigation Support	2	46.31	4.73	0.010*
Group Structure	1	188.91	19.33	0.000*
Navigation Support * Group Structure	2	30.09	3.08	0.048*

**Table 2. Results on Actual Shared Understanding: Multiple Comparisons of Navigation Support**

Group A	Group B	Mean difference (A-B)	Sig.
Separate Navigation with Location Cue (mean: 11.542)	Split Screen Navigation	-1.4028	.028*
	Tightly-Bonded Shared Navigation	-.0278	.999
Split Screen Navigation (mean: 12.944)	Separate Navigation with Location Cue	1.4028	.028*
	Tightly-Bonded Shared Navigation	1.3750	.033*
Tightly-Bonded Shared Navigation (mean: 11.569)	Separate Navigation with Location Cue	.0278	.999
	Split Screen Navigation	-1.3750	.033*

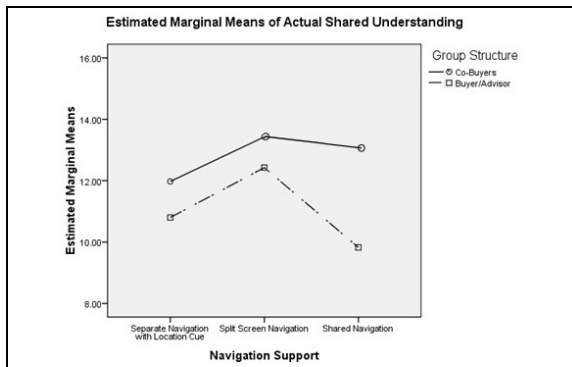


Figure 1. Results on Actual Shared Understanding

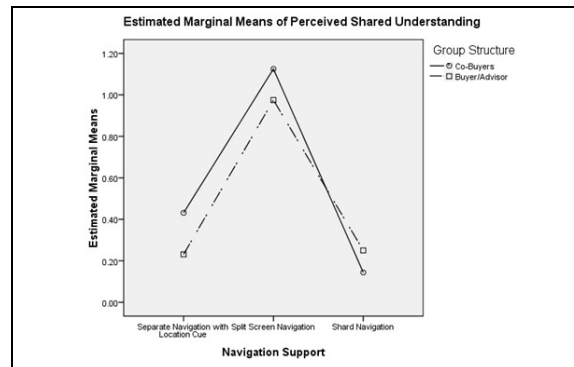


Figure 2. Results on Perceived Shared Understanding

### Results on Perceived Shared Understanding

The composite reliability and Cronbach alpha of perceived shared understanding are 0.92 and 0.89 respectively. They are well above the generally acceptable level of 0.70 for adequate internal consistency (Jiang and Benbasat 2007).

The results of ANOVA on perceived shared understanding imply that there is significant main effect of navigation support, whereas the interaction effect between navigation support and group structure are not significant (as shown in Table 3). *Post hoc* analysis based on Scheffe test reveals that (see Table 4): (1) split screen navigation leads to significantly higher perceived shared understanding than tightly-bonded shared navigation, thus supporting H2b; (2) although split screen navigation leads to higher perceived shared understanding than separate navigation with location cue, the difference is not significant, thus rejecting H1b; (3) separate navigation with location cue has no significant difference from tightly-bonded shared navigation in terms of perceived shared understanding, thus rejecting H3b.

Source	df	Mean square	F	Sig.
Navigation Support	2	14.258	3.189	0.043*
Group Structure	1	0.10	0.002	0.962
Navigation Support * Group Structure	2	0.112	0.025	0.975

The insignificant interaction effect suggests that the effects of navigation support on perceived shared understanding are not moderated by group structures (see Figure 2). Therefore, H5a and H5b are not rejected.

Group A	Group B	Mean difference (A-B)	Sig.
Separate Navigation with Location Cue (mean: 0.465)	Split Screen Navigation	-.6097	.236
	Tightly-Bonded Shared Navigation	.2584	.770
Split Screen Navigation (mean: 1.073)	Separate Navigation with Location Cue	.6097	.236
	Tightly-Bonded Shared Navigation	.8681	.050*
Tightly-Bonded Shared Navigation (mean: 0.205)	Separate Navigation with Location Cue	-.2584	.770
	Split Screen Navigation	-.8681	.050*

### Impacts of Shared Understanding

In the present study, we apply PLS to test the impacts of actual and perceived shared understanding on perceived decision quality and intention to return. Using Smart-PLS software, we first examined the measurement model to assess reliability and validity before testing the structural model. Tables 5 and 6 show the measurement model results, including information about reliability, validity, correlations and

factor loadings. Both composite reliability and Cronbach alpha values are above 0.80, suggesting that the scales were reliable. The pattern of loadings and cross-loadings supports internal consistency and discriminant validity (Gefen and Straub 2005; Hair et al. 2011). Meanwhile, the square root of the AVE of all latent variables are greater than the correlation between this particular construct and other constructs, which further supports the discriminant validity (Barclay et al. 1995).

Structural model was then tested using bootstrap resampling technique, and the results are present in Figure 3. It suggests that perceived shared understanding positively correlates with perceived decision quality but actual shared understanding doesn't. Therefore, H7 is supported, but H6 is not. Moreover, the results indicate that perceived decision quality has a significant positive effect on intention to return, thus H8 is supported.

**Table 5. Cross Loadings of Measurement Items to Latent Constructs**

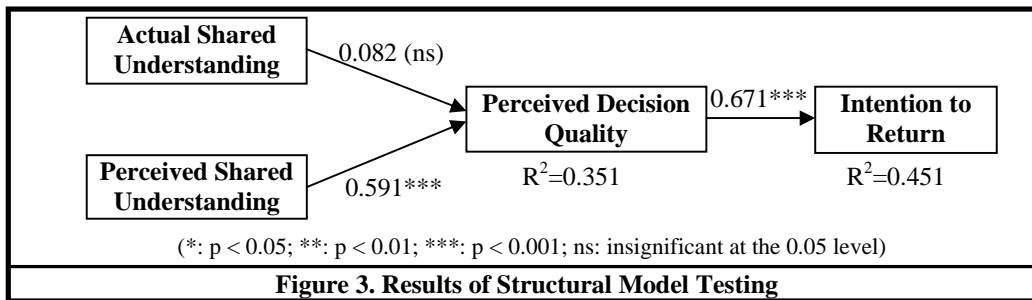
	Perceived Shared Understanding	Actual Shared Understanding	Perceived Decision Quality	Intention to Return
PSU1	<b>0.89</b>	0.02	0.52	0.48
PSU2	<b>0.88</b>	0.01	0.53	0.50
PSU3	<b>0.88</b>	-0.10	0.50	0.51
PSU4	<b>0.81</b>	-0.09	0.48	0.43
ASU	0.05	<b>1.00</b>	0.05	0.01
PDQ1	0.56	0.06	<b>0.92</b>	0.63
PDQ2	0.54	0.03	<b>0.76</b>	0.52
PDQ3	0.50	0.04	<b>0.91</b>	0.57
PDQ4	0.45	0.06	<b>0.91</b>	0.62
INT1	0.55	0.02	0.66	<b>0.96</b>
INT 2	0.54	-0.04	0.62	<b>0.97</b>
INT 3	0.53	0.02	0.64	<b>0.96</b>
INT 4	0.52	-0.01	0.65	<b>0.95</b>

Note: Actual shared understanding is indicated by a single index in the PLS model.

**Table6. Correlation of the Latent Variable Scores with the Square Root of AVE**

	Cronbach's Alpha	Composite Reliability	Perceived Shared Understanding	Actual Shared Understanding	Perceived Decision Quality	Intention to Return
<b>PSU</b>	0.89	0.92	0.87			
<b>ASU</b>	1.00	1.00	0.05	1.00		
<b>PDQ</b>	0.90	0.93	0.59	0.05	0.88	
<b>INT</b>	0.97	0.98	0.56	0.01	0.67	0.96

Note: Each diagonal element, which is the square root of the average variance extracted for the respective construct, exceeds all the correlations in the corresponding row and column (Fornell and Larcker 1981).



## Discussion and Conclusions

### Discussion of Results

The results show that split screen navigation in general is superior to tightly-bonded shared navigation in increasing collaborative customers' actual and perceived shared understanding. Split screen navigation support only leads to more actual shared understanding than separate navigation with location cue, but

not more perceived shared understanding. It seems that the effort to use separate navigation with location cue is not as large as we might initially have expected. The results are consistent with the theoretical foundations of common ground and grounding cost.

The findings also indicate that the difference between separate navigation with location cue and tightly-bonded shared navigation is not significant, as Hypothesis 3a, 3b and 4b are not supported. The reason may be that the benefits of separate navigation with location cue to enable collaborative customers to have flexible means to interact with the website by their own counteract the cost of less common ground when compared to tightly-bonded shared navigation, resulting in no significant differences between the two navigation support designs. Furthermore, perceived shared understanding was found to positively relate to perceived decision quality, which in turn has a positive influence on customers' intention to return. However, the influence of actual shared understanding on perceived decision quality is insignificant. The findings imply that only perceived shared understanding has an impact on perceived decision quality, but actual shared understanding doesn't.

### ***Theoretical Contributions***

The current study explores the effects of various navigation support designs on collaborative customers' communication performance in undertaking COS. We have proposed two new navigation support designs and they are compared together with tightly-bonded shared navigation support. To the best of our knowledge, this is one of the first studies in IS discipline to empirically investigate the effectiveness of a wide range of navigation support designs in COS context.

While prior IS research and practice mainly focuses on customers' individual shopping behavior in e-commerce, a recent trend is for customers to buy things together online. This research advances our theoretical understanding in IS field by disclosing the knowledge of customers' collaboration behaviors in COS context. Our results have indicated that navigation support designs have different effects on customers' perceived and actual shared understanding. Meanwhile, the findings suggest that perceived shared understanding, rather than actual shared understanding, has positive impact on perceived decision quality, which in turn influences customers' intention to return.

Furthermore, this paper identified that group structure could significantly moderate the effectiveness of various navigation support technologies. Group structure has been widely investigated in prior GSS and organizational studies. However, its effects in e-commerce field have not yet been discussed. This study contributes to this knowledge gap by disclosing the effect of group structure in collaborative online shopping context.

### ***Practical Implications***

This paper would provide helpful insights for online vendors and website designers to deploy and design appropriate navigation support according to different purposes. Specifically, the results indicate that split screen navigation would generally be more helpful than separate navigation with location cue to improve customers' actual knowledge of their partners' opinions towards the products. Meanwhile, in terms of perceive shared understanding, split screen navigation appears to be a better design choice than tightly-bonded shared navigation. Rather than binding shopping companions on the same browser and synchronously navigating at the same pace, the provision of more control for customers to navigate at their own discretion would be helpful to improve customers' COS experience.

Also, as customers in co-buyers structure and buyer/advisor structure have different needs for conveyance and convergence processes during the shopping process, systems designers and online vendors should take the group structure into consideration when they want to design or deploy appropriate collaboration support for customers with different role combinations.

### ***Limitations and Future Research***

In the present study, we only consider shopping group with two persons. In reality, shopping groups with more than two persons are also common. Since the interaction pattern may be different when more

people are involved in the shopping process, care should be taken in generalizing our findings to groups with more than two people. Also, the effects of collaborative online shopping may depend on the type of products being evaluated. In our study, participants were requested to book hotels, which could be considered as experience goods. Caution should be taken in generalizing these results to other product categories. Hence, future research could test the effects of navigation support on customers' shopping experience using search products and having more people in the same shopping group.

Moreover, since different navigation support may have distinct degree of synchronicity, future study can explicitly measure and classify the synchronicity of various navigation support designs, and explore the effect of navigation support from synchronicity perspective. Finally, although this study has found an overall moderating effect of group structure, it is possible that the effects of navigation support on customers' collaborative online shopping experience may also be moderated by other possible factors (e.g. closeness or trust between shopping companions). Future research could devote more effort to explore other potential moderators in collaborative online shopping context.

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## Appendix: Measures of Constructs

### Perceived Shared Understanding (Adapted from Katz and Te'eni, 2007)

PSU1: Which navigation support allowed you and your partner to understand more about each other's opinions on each hotel that you two evaluated together?

The **First** navigation support used in the base task    Equal    The **Second** navigation support used in the formal task

5      4      3      2      1      0      1      2      3      4      5

PSU2: With which navigation support could you and your partner more easily understand each other during the collaborative hotel booking process?

PSU3: With which navigation support were you and your partner more able to understand each other's viewpoints throughout the collaborative hotel booking process?

PSU4: Which navigation support was more likely to allow you and your partner to know about what the other person was thinking throughout the collaborative hotel booking process?

### Perceived Decision Quality (Adapted from Tan et al., 2010)

PDQ1: With which navigation support were you and your partner more likely to believe that you two have made the best choice of hotels on the website?

PDQ2: With which navigation support would you and your partner more likely to make the same choice if you two had to book a hotel on the website collaboratively again?

PDQ3: With which navigation support were you and your partner more likely to believe that the hotel finally selected is the most suitable on the website?

PDQ4: With which navigation support were you and your partner more likely to think you two have picked a good hotel on the website?

### Intention to Return (Adapted from Koufaris, 2002)

INT1: Should you and your partner need to book a hotel when you two are at different locations, with which navigation support is it more likely for you two to visit the website again?

INT2: Should you and your partner need to book a hotel when you two are at different locations, with characteristics similar to which navigation support is it more likely for you two to visit the website?

INT3: With which navigation support is it more likely for you and your partner to revisit the website in the future?

INT4: With which navigation support is it more likely for you and your partner to recommend the website to other friends?

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