THE EFFECTS OF NAVIGATION SUPPORT AND GROUP STRUCTURE ON COLLABORATIVE ONLINE SHOPPING PERFORMANCE

CHENG YIHONG

(Bachelor of Engineering), Renmin University of China

A THESIS SUBMITED

FOR THE DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF INFORMATION SYSTEMS

NATIONAL UNIVERSITY OF SINGAPORE

2012

ACKNOWLEDGEMENT

First of all, I would like to express my sincere gratitude and great respect to my supervisor, Prof. Jiang (Jack) Zhenhui. I appreciate all his contributions of time, ideas and encouragement to my research work, as well as his invaluable guidance and suggestions in my academic life. I am also deeply grateful for his understanding for my personal life, especially during the tough time I encountered during my M.SC journey.

I would like to thank all my friends at NUS. You have provided me an environment full of warm and love. We share so many memorable stories and encourage each other to pursue our dreams and future together. You are my invaluable fortune in the rest of my life. Special thanks must be given to Ben, Yi Cheng, Chen Jin and Sha Xiqing, it was you that helped and encouraged me all the way along. I am so lucky to have you all as my best friends!

I am also grateful to my girl friend, Zhang Yuying for her encouragement, understanding, and faithful support over the past four years.

Last and most importantly, I would like to express my greatest appreciation to my parents, for their unconditional support and great love.

TABLE OF CONTENTS

SUMMARY

As a new paradigm of e-commerce, collaborative online shopping fulfills online customers' needs to shop with close ones in a social and collaborative environment. Various navigation supports are designed to facilitate customers' collaborative online shopping experience by providing collaboration support. This study analyzes the impacts of four different navigation supports. Specifically, a research model is proposed to investigate the effects of four navigation supports on customers' online shopping experience. Two constructs used to measure customers' online shopping experience are perceived coordination performance and perceived information search scope. Meanwhile, the moderating role of group structure is also explored. In addition, we also tested the effects of consumers' online shopping experience (i.e., perceived coordination performance and perceived information search scope) on consumers' perceived decision quality. A laboratory experiment is designed to test the proposed model and hypotheses.

LIST OF TABLES

LIST OF FIGURES

1. Introduction

E-commerce, especially online sales, has been attracting the whole world's attention, even under current economic crisis. In the last decade, online sales increased at an alarming rate in U.S. In 1996, consumer sales over Internet were unimpressive, just $520 million—less than 0.03 percent of the $2.2 trillion total (Burke 1998). However, in 2008, online sales grew over to $141 billion and are predicted to reach $229 billion in 2013, according to Forrester, a consultancy. Given the vast economical and social value, it is necessary and important for researchers to study and better understand this phenomenon.

Previous studies exploring e-commerce, especially business-to-consumer context, have predominately focused on online individual shopping (Wolfinbarger and Gilly, 2001; Weiyin Hong, et al., 2005; Monsuwe, et al., 2004; Childers, et al., 2001), although consumers often aspire to conduct their shopping activities with companions. Surprisingly, there are dearth of studies concerning about collective shopping activity (Mangleburg, et al., 2004), especially collective online shopping (Zhu, et al., 2010). This study attempts to fill this research gap by focusing on collaborative online shopping, defined as "the activity in which a consumer shops at an online store concurrently with one or more remotely-located shopping partners" (Zhu, et al., 2009), for three reasons. First, the extensively investigated individual online shopping is only part of the broad concept of online shopping. It is the individual and collaborative online shopping together that contributes to total online sale. According to Ahuja and his colleagues' report (Ahuja et al. 2003), one of the major reasons why people do not buy on the Internet attributes to the lack of social interaction during the shopping process. In other

words, a shopping partner who endows online shopping with social interaction and communication may lead to a potential purchase.

In IS discipline, there has been numerous studies exploring consumer behavior in individual online shopping context (Wang and Benbasat, 2009; Xiao and Benbasat, 2007; Tan et al 2011). However, most of them focused on the interaction between individuals and the online shopping systems (e.g., recommendation adds and decision aids, etc.). For instance, in their research exploring how consumers use online decision aids with screening and evaluation support to make purchase decision, Tan et al (2011) found that only when the decision aids render cognitive resources that match those demanded for task environment, consumer will process more information and decision performance will be enhanced. All these studies helped to better understand the individual decision-making process, and shed light on various IT artifacts deployed to enhance different information processes. Unfortunately, the findings explored in individual online shopping context may be of little help to understand the characteristics of, and process in collaborative shopping. With the addition of another new element (i.e., a shopping partner or shopping partners), collaborative online shopping not only looks into interaction between consumer and shopping website, which is the focus of individual online shopping, but also into interaction between shopping partners with the help of various supporting tools.

Secondly, shopping is often a social process, in which a shopper is accompanied by friends or family members (Evens, et al., 1996). People desire to communicate with others who have similar interest, to share idea about particular products, to seek feedback, and to enjoy leisure time with friends and family (Tauber, 1972). Collaborative online

shopping takes in the social aspect of online shopping and tries to fulfill the desire of shopping together for geographically distributed people. With the rapid development of information technology, various co-shopping tools have been implemented in order to improve collaborative online shopping experience. For example, Plurchase.com provides a feature that enables consumers at different locations to get contextual information about the product which his/her partners are currently examining, while Clavardon.com allows shopping companions to always stay on the same web page to examine product information. In spite of the emergence of a growing number of collaborative online shopping tools, little research attention has been paid to investigate the effectiveness of these tools. For example, Zhu, et al (2010) found that compared to separate navigation, shared navigation enhanced coordination performance by reducing uncoupling incidents and facilitating uncoupling resolution process. However, the authors also acknowledged that more navigation support functions could be examined to not only look at coordination performance across the whole online shopping process, but also decision making relevant variables, such as decision quality.

Finally, we consider collaborative online shopping as a type of collective decision making process in which participants may engage in information acquisition, information integration and information utilization in a non-linear way to make a final decision (Hinsz, et al 1997). However, previous studies on computer-mediated collaborative decision making have mainly focused on organizational environments and educational contexts (Alavi and Leidner, 2001; Rangaswamy and Shell, 1997; Dabbish and Kraut, 2008). These studies investigated how people carry out working task or learn collaboratively with the help of different groupware technologies, such as email, desk-

conferencing, group support systems, and notification system, to make decisions. Therefore, additional research effort is needed to analyze and evaluate collaborative online shopping technologies theoretically and empirically under the umbrella of collective decision making to advance the IS knowledge.

The objective of the present study is to investigate the design of a collaborative online shopping tool by identifying one of its prime features, namely, navigation support. Navigation is one of the fundamental processes of collaborative online shopping. By using a navigation tool, shopping companions can navigate to a particular product of potential interest and discuss extensively before making any purchase decision. Additionally, previous research on collaborative online shopping also called for studies to comprehensively investigate navigation support. For instance, Zhu et al (2010) suggested that except for shared navigation, there are other navigation support tools, such as an enhanced restricted focus viewer (ERFV), eye-tracker technologies and split screen navigation that are largely under-investigated. More specifically, this study empirically compares and evaluates the effects of four types of navigation support tools (i.e., separate navigation, separate navigation with location cue, split screen navigation and shared navigation) on shoppers' perceived coordination performance and perceived information search scope. Two indicators of coordination performance are investigated: perceived uncoupling and perceived ease of resolution. Moreover, both perceived coordination performance and perceived information search scope are embedded within a nomological network to assess their relative effects on decision quality related variables (i.e. perceived decision quality, decision quality and decision time).

Another purpose of this study is to investigate the moderating effects of group structure on the effectiveness of navigation support tools. Group structure is defined as an indication of the role combination among group members. These roles can be either pre-assigned to or randomly formed in different group decision making contexts. Extensive studies have revealed the importance of investigating group structure in group decision making context (see Straus et al 2009; Sniezek and Buckley 1995). Likewise, since we consider collaborative online shopping as another form of collective/group decision making process, it would be reasonable and necessary to include group structure in our study and investigate its interaction effect with navigation support on shopping companions' perceived coordination performance and perceived information search scope.

Overall, this study aims to make three contributions. First, it compares four types of navigation support, including separate with location cue and split screen that have been overlooked in previous collaborative online shopping studies. Second, it explores the different effects of navigation support on perceived coordination performance and perceived information search scope, as well as the different effects of these two shopping process variables on perceived decision quality. Third, this study investigates the moderating effect of group structure on perceived coordination performance and perceived information search scope, which has not been examined by any previous empirical study.

This paper is organized as follows. In session 2, we review previous literature and discuss the theoretical foundations. Section 3 introduces the four navigation support tools (including the benchmark tool, separate navigation) for collaborative online shopping. A

research model is then developed in section 4 to demonstrate how different navigation support tools influence shopping group's collaboration through the provision of common ground and situation awareness. Section 5 describes the research method used in present study, including the study's setting and data collection procedure. Section 6 discusses data analysis procedure and corresponding results. The implications, contributions, and limitations of this study and suggestions for future research are discussed in the final section.

2. Literature Review and Theoretical Foundations

2.1 Real Time Distributed Collaboration

Collaborative technologies, such as group support system (GSS) and video-conferencing, allow people to conduct real time distributed collaboration that participants work together at the same time when some or all of them and their work products are in different physical locations (Greenberg 1999). In a typical real time distributed collaboration environment, participants communicate with one another, keep aware of partner's situation and orchestrate their interactions to execute tasks. In general, several mechanisms have been identified that are responsible for the facilitation of real time distributed collaboration, such as information sharedness (i.e., the extent to which information is mutually possessed and understood) between participants and awareness towards the external environment, including who is the partner, where is he/she, and what is he/she doing (Carroll et al 2003; Gutwin and Greenberg 1999; Dillenbourg and Traum 1999). Existing literatures on real time distributed collaboration have mainly focused on organizational context (Baltes et al., 2002; Dennis, 1996; Kerr and Tindale, 2004; Kiesler and Sproull, 1992; Schulz-Hardt et al., 2006; Banker et al. 2006; Dabbish and Kraut 2008). For example, Dabbish and Kraut (2008) found that the use of a real time distributed collaborative system which enables the provision of awareness information about a remote collaborator's work load leads to a less disruptive communication attempt, and further enhances the whole collaboration performance. Banker et al. (2006) found that the implementation of collaborative product design could improve product quality, reduce design cycle time, and low product development costs.

Collaborative online shopping, according to its definition, is also a type of real time distributed collaboration, in which physically distant shopping partners collaboratively search for and evaluate on products of potential interest together and jointly make a purchase decision. Recent research on collaborative online shopping has investigated some of the features considered as essential in real time distributed collaboration context. For instance, Zhu et al (2010) compared shared navigation with separate navigation (differ in information sharedness) in a laboratory study, and found that co-shoppers' coordination performance is much more favorable with the former navigation support. Therefore, it is reasonable to contend that theories and findings that have been widely recognized in other real time distributed collaboration contexts may be also applicable to collaborative online shopping.

Two relevant theories on common ground and situational awareness are discussed below to provide theoretical foundations to uncover the underlying mechanism of coordination process in collaborative online shopping context. Moreover, the potentially negative effects of provision of intensive awareness information on consumers' coordination performance and ensuing perception are also included for discussion. In addition, the consumer information search model will be delineated to help us understand consumers' information search choice. Finally, in order to explain the moderating effect of group structure, we will also introduce the concept of dual-task interference.

2.2 Common Ground Theory

A well appreciate requirement for successful collaboration, cooperation, and collaboration is common ground (Dourish and Bellotti 1992). Common ground is

originally considered to be mutual knowledge, mutual beliefs, and mutual assumptions (Clark and Carlson, 1982). It is vital for effective coordination among collaborators, because it provides them with shared referential base for discussion and ensures that the knowledge transferred connotes the same meaning for both the sender and the recipient (Clark, 1996; Cramton, 2002). All collective actions are built on common ground and its accumulation, such as communication and collaboration (Clark and Brennan, 1991). Establishing common ground is important because it increases the likelihood that communication will be understood (Clark 1996; Clark and Carlson 1982; Clark and Marshall 1981; Fussell and Krauss 1992). In contrast, without common ground, people communicate and collaborate based on their own understanding and perception (i.e. privileged ground) which may not be socially constructed and this always results in uncoupling or misunderstanding, which further leads to a poor performance (Miranda and Sauder, 2003).

Moreover, common ground is a static state. To coordinate on process, collaborators need to update their common ground moment by moment (Clark and Brennan, 1991), making distributed privileged ground part of their "new" common ground. This process is mentioned as grounding. Grounding is so basic to communication that common ground cannot be properly established or updated without this process (Clark and Brennan, 1991). According to Clark and Brennan (1991), eight constraints of media (i.e., co-presence, visibility, co-temporality, simultaneity, sequentiality, reviewability and revisability) have been identified and demonstrated to influence grounding process. More specifically, a media lacks any of these characteristics will increase the cost of grounding, thus impair the grounding process. For example, Clark and Brennan (1991) contended that the same

environment contributes to grounding by providing peers with the same access to information, i.e. they both see or hear same things (co-presence) and make it easier to reach a common ground. However, people in distributed or different environments are not able to receive the identical information and thus cannot understand each other easily. As a result, they may need to initiate extra conversations or communications for grounding purpose. In line with this argument, Zhu et al (2010) observed that common ground could be established more efficiently by showing the same web contents to both participants (co-presence). In addition, they also found that shopping groups with higher common ground performed better than those with lower common ground as those with higher common ground encountered few uncoupling and are able resolve any emerged uncoupling faster.

Based on these findings, it is reasonable to conjecture that common ground could be useful in helping collaborative shoppers to coordinate their behavior; and that lowering the cost of grounding could contribute to the ease of establishing common ground, and further facilitate collaboration.

2.3 Situational Awareness

Situation Awareness (SA) is generally defined as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future" (Endsley 1998). SA includes more than perceiving or attending to information, but also the integration of multiple pieces of information and a determination of their relevance to the person's goal (Endsley 2000). SA plays an important role in various collaborative activities. It can reduce effort,

increase efficiency, and reduce errors for the activities of collaboration (Gutwin and Greenberg 2001). With the help of SA, people are able to keep an up-to-the-moment understanding of other people's interaction with their shared workspace, which in turn guides people's ensuing behavior, such as when to make a communication attempt. In contrast, without good situation awareness, the ease and naturalness of collaboration will be lost, making remote collaboration awkward and inefficient as compared to face-to-face work (Gutwin and Greenberg 2001). Prior studies have extensively investigated the influence of SA on collaboration performance. For example, Carroll et al (2009) argued that collaborators must attain and maintain reciprocal awareness of shared activity to coordinate effectively. Similarly, Gutwin and Green (2001) observed that situation awareness can help in the management of uncoupling and coordination of actions during collaboration.

In spite of its reputable positive effect on collaboration performance, situation awareness is also queried for its potential negative influence on individual information processing. Inronically, when it exceeds a certain amount, it may ultimately hamper collaboration performance instead. In particular, according to SA theory, multiple competing cues may ask for attention and cognitive resource simultaneously. Therefore, people are quite likely forced to choose some of the situation cues to process, while ignoring quite amount of others as our working memory and attention are limited (Endsley 2000). This effect would be more salient when multiple competing cues are of equal importance.

2.4 Consumer Information Search

Information search represents the primary stage at which consumers actively collect information to make potentially better purchase decisions (Schmidt and Spreng 1996). Drawing on two well-established theoretical perspectives of external information search: the psychological/information processing approach and the economics perspective, Schmidt and Spreng (1996) proposed an integrated model of consumer information search. Four variables, namely, perceived ability, motivation, costs and benefits are identified to influence the extent of consumers' information search. Specifically, perceived ability to search (i.e., the extent to which people feel their cognitive capability of searching for and processing information) is found to be positively related to the extent of information search. Motivation, mainly refers to involvement in this study, is defined as the extent to which people perceive the personal relevance to the search activity. Consumer behavior theories have suggested that consumers engage in more searches when involvement is high and less search when involvement is low (Engel et al. 1993; Hawkins et al. 1986; Howard and Sheth 1969).

Benefit is reflected in the concept named information required for choice rule in this study. As suggested by Spreng and Olshavsky (1989), the amount of information desired will be partially a function of the choice rule the consumer uses. For example, in the situation where a consumer decides to help his/her partner to search for a product, the only information desired would be those describing the attributes in which his/her partner is interested. Since the choice rule is pretty simple and clear, it is quite likely that less information is required and the consumer will engage in less information search activity

as compared to when the choice rule is complicated. Finally, cost is conceptualized as information accessibility in this study. Information accessibility refers to the extent to which information is available and accessible to the consumer in a format that the consumer can use (Bettman 1979). The more accessible the information is in the environment, the lower the cost will be to search and process information (Bettman et. al 1991). Similarly, Schmidt and Spreng (1996) argued that information accessibility will be higher when consumers are aware of the availability of information, which will further lead to more information search activity.

Based on these findings, it can be inferred that perceived ability to search, involvement, information required for choice rule, and information accessibility could be useful in helping us to understand the effects of various navigation supports on consumers' perceived information search scope.

2.5 Dual-task Interference and Cognitive Capacity

Dual-task interference is a well known and well studied phenomenon (Pashler 1994). Generally speaking, dual-task interference refers to the situation that when people perform two or more activities concurrently, the performance on either or both activities may be impaired. There are several theoretical underpinnings for dual-task interference, while the most common and widely accepted one is called "bottleneck" models. This perspective assumes that individuals have a limited cognitive capacity that can be shared among tasks. Cognitive capacity is a kind of scare mental resource (Navon and Gopher, 1979). When individual attempts to perform two tasks at the same time, each task may compete for accessing to this scarce resource. Comparing to the single task situation, less

cognitive capacity is distributed to each individual task, and the performance will be impaired. Prior empirical studies in IS have suggested that in a GSS system, participants who experience dual-task interference (e.g., interacting with others while monitoring the discussion) process less information (poorer performance) than participants only monitoring the discussion (single task) (Heninger et al, 2006). Similarly, in the collaborative online shopping context, it is quite common for shopping partners to search for product information separately while keeping another eye on each other's shopping activities for potential discussion. Thus, it is quite possible that dual-task interference will happen in between at any time.

2.6 Navigation Support Technologies for Collaborative Online Shopping

Extant shopping websites have provided shopping companions with various instant communication and navigation tools (e.g., Plurchase.com, Brosix.com, Twiddla.com and Clavardon.com) to help them shop online together and enjoy a pleasing shopping experience, which may further lead to a potential purchase. Based on our comprehensive examination on the features of navigation support tools, this study investigates four types of navigation support, i.e., separate navigation, separate navigation with location cue, split screen and shared navigation. We will elaborate on the functions of all these navigation support tools and briefly explain their advantages as well as potential disadvantages.

Separate navigation is the most common navigation support that has been widely used by many traditional shopping websites. Simply speaking, it comprises of one individual browser. Therefore, shopping companions physically located at different places can browse shopping websites freely and independently through their own browsers. However, in order to coordinate their navigation behavior, they will have to seek help from additional instant communication tools (e.g., text chat and voice chat). Obviously, independent information search is the major advantage of separate navigation. Nevertheless, it would be impossible for dispersed people to coordinate their navigation behavior without extra support.

Separate navigation with location cue inherits the design of separate navigation, thus enable shopping companions to navigate freely with individual browsers. In addition, as suggested by its name, a visual indicator, namely location cue, is also embedded in each individual browser. The location cue presents a thumbnail image as well as the name of a

product that the shopping partner is currently examining (see Figure 1, the red rectangle area is used to display location cue information). In other words, the location cue information is updated in real time, thus once the shopping partner changes to another product page, the other shopper could recognize immediately if he/she wants. Meanwhile, one shopper could easily navigate to the same web page that his/her partner is looking at by simply clicking on the location cue information. With the help of location cue information, shopping companions are able to coordinate their navigation behavior at a web page level.

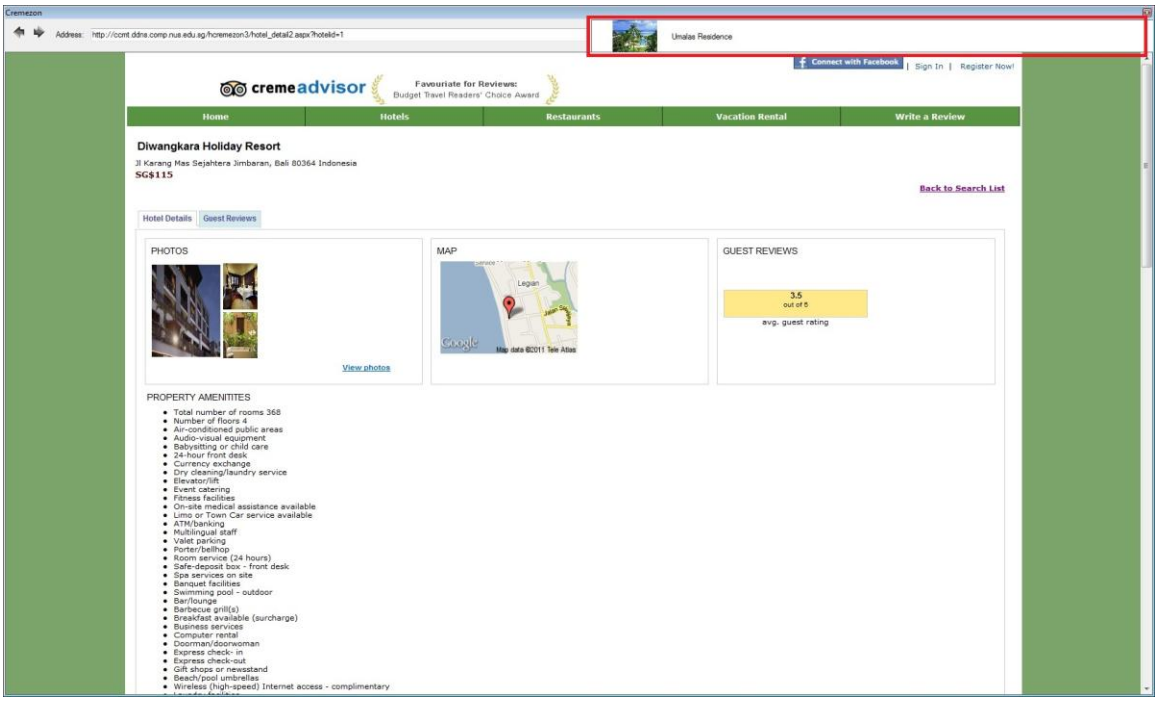

Figure 1. Separate Navigation with Location Cue

Split screen navigation divides individual full window browser into two separate screens, with one screen (personal screen) controlled by the consumer as an ordinary browser and the other screen (shared screen) timely displaying the current web page his/her partner is viewing (see Figure 2, the left side screen is the personal screen while the right side one

is the shared screen). Unlike separate navigation with location cue, split screen navigation enables shopping companions to watch each other's real time and detailed navigation behavior from the shared screen. In other words, customers can fully control the personal screen and navigate freely. However, they cannot operate on the shared screen, but only watch and get contextual information about which web page or what information block his/her partner is looking at. The shared screen on the customer's monitor can be considered as a timely duplicate of the personal screen of his/her partner.

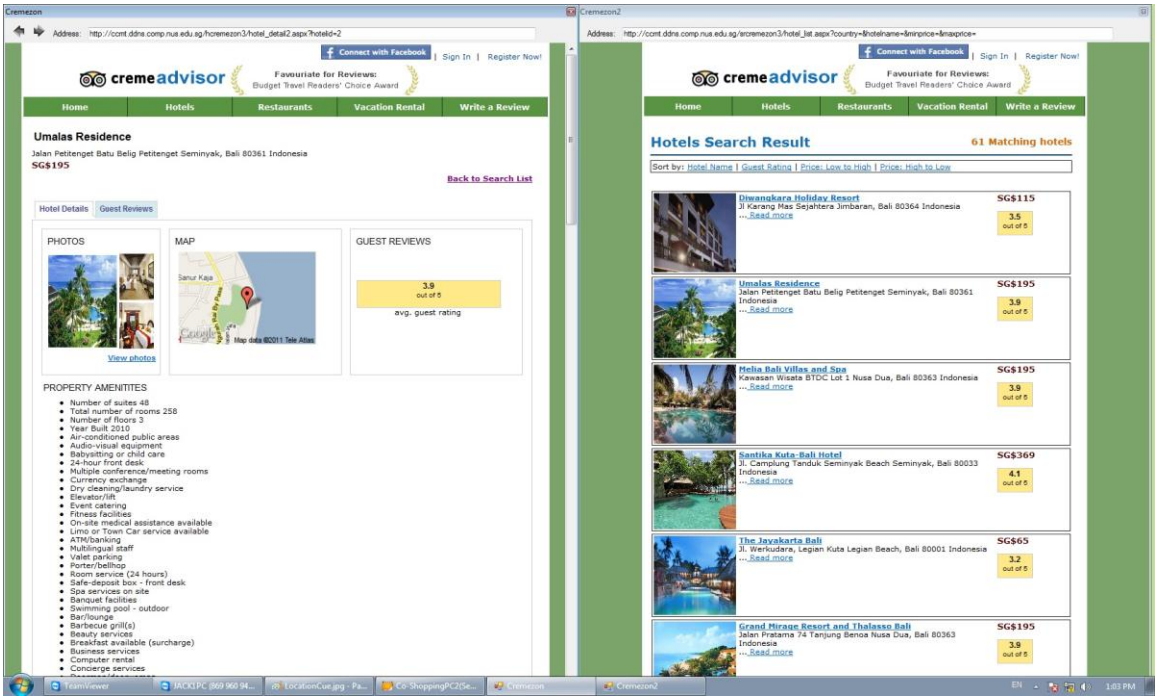

Figure 2. Split Screen Navigation

Shared navigation integrates the personal view and shared view into a single shared browsing window. With the help of shared navigation, shopping companions are always able to view exactly the same web page, i.e. if one customer navigates to a different web page or scroll a web page up or down, his/her partner's browser will be affected simultaneously. Meanwhile, shoppers are able to view the real time mouse movement and

highlighting contents (e.g., text, images etc.) by their partners (see Figure 3, the contents in the red rectangle box is actually highlighted by the other shopper). Both of the shopping companions are granted with equal power to control this completely shared browser.

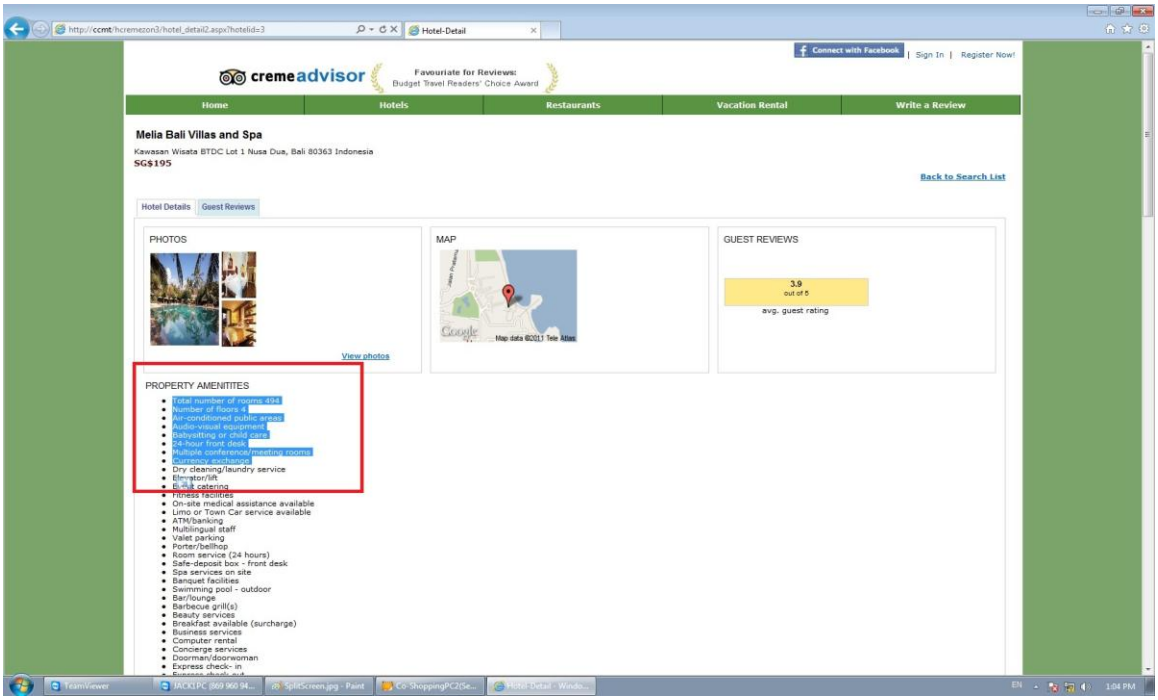

Figure 3. Shared Navigation

Table 1. Comparisons of The Four Types of Navigation Support

Navigation Support	Individual Navigation	Coordinated Navigation
Separate navigation	Strongly supported	Weakly supported
Separate navigation with location cue	Strongly supported	Moderately supported
Split screen navigation	Moderately supported	Moderately supported
Shared screen navigation	Weakly supported	Strongly supported

3. Research Model and Hypothesis Development

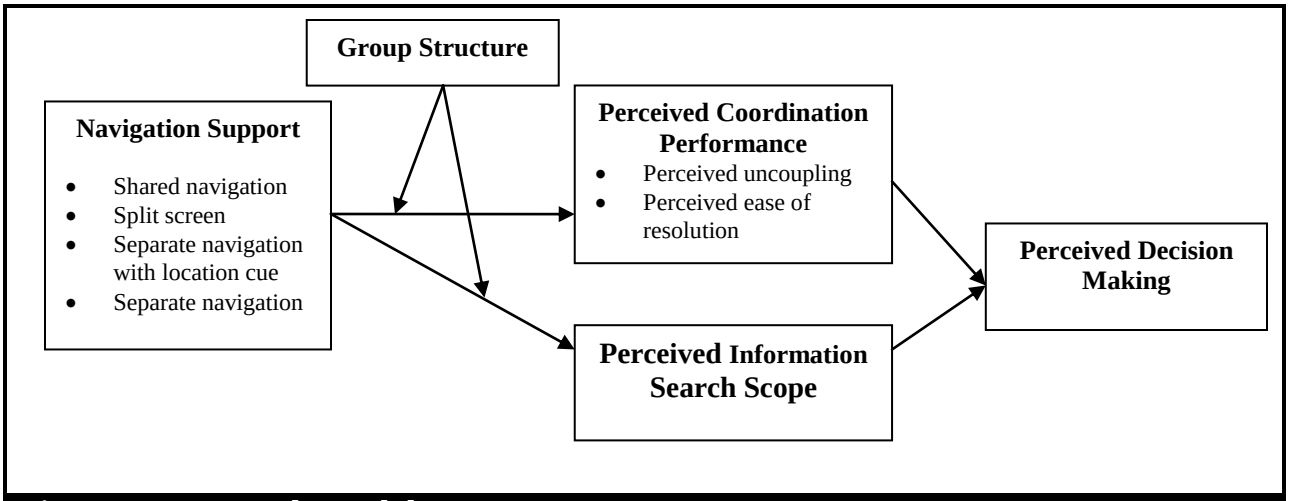

Figure 4. Research Model

3.1 Independent and Dependent Variables

In this study, we examine the effect of four types of navigation support that are either widely applied or potentially promising in current online shopping websites: separate navigation, separate navigation with location cue, split screen navigation and shared navigation, and investigate the moderating role of group structure.

Information search has been considered as an important stage for web-based customer decision making (O'keefe and McEachern, 1998). In information search stage, customers actively collect information to make potentially better purchase decisions (Schmidt and Spreng 1996), whereas insufficient information search may lead to detrimental decision performance (Tan et al., 2010, Keller and Staelin 1987). In collaborative online shopping context, information search is jointly performed by both parties. Therefore, conflicts may occur frequently when the two shoppers follow discrepant product search paths at times, and their actions may interfere with each other (Shen et al. 2002). Therefore, the key to a successful collaborative information search is to coordinate shopping companions'

browsing actions so as to accurately and efficiently locate product information of common interest (Diamadis and Polyzos 2004). Meanwhile, the amount of information jointly searched and evaluated should be sufficient for shopping companions to make a more informed decision. If there is a lack of smooth coordination, one cannot easily locate and examine the product that his/her companion is examining; or if there is only a limited amount of information been thoroughly processed, shopping companions are not able to make an informed purchase decision; consequently, the primary purpose of collaborative online shopping cannot be achieved (Zhu et al. 2010). In this study, perceived coordination performance and perceived information search scope are included as dependent variables correspondingly to represent the two vital elements in collaborative online shopping as both of them will further have an influence on decision making.

Two dimensions of perceived coordination performance have been identified: perceived uncoupling and perceived ease of resolution. Perceived uncoupling refers to customers' perceptions of the extent to which they lose coordination with their partner when shop online together. Perceived ease of resolution is defined as customers' perceptions of the extent to which effort has been made to resolve uncoupling occurred during collaborative online shopping process. Previous research on collaborative online shopping has investigated the influence of shared as well as separate navigation on customers' coordination performance, measured by two objective variables: number of uncoupling incidents and the number of communication exchanges used to resolve each uncoupling incident (Zhu et al. 2010). Zhu and her colleagues (2010) further identified three types of uncoupling: inter-screen uncoupling, intra-screen focal uncoupling, and intra-screen

navigational uncoupling. Specifically, inter-screen uncoupling occurs when collaborative shoppers are not exposed to the same web page at the same time, and therefore, cannot clearly figure out what product the other party is actually referring to. Intra-screen focal uncoupling occurs when collaborative shoppers who are exposed to the same web page at the same time fail to properly coordinate their information search for target product. Intra-screen navigational uncoupling occurs when a shopper's action affects his/her companion's product examination though both looking at the same web page. This study adopts the definition and categorization of uncoupling proposed by Zhu et al (2010) to help develop some of the arguments.

Perceived information search scope is defined as customers' perception of the amount of product alternatives for which detailed information is acquired (adapted from Moorthy et al. 1997). This is an indicator of the effort an individual expends on searching and evaluating available product alternatives (Haubl and Trifts 2000). Perceived decision quality refers to the extent to which online shoppers feel the final decision is of good value. Exploring the influence of other central variables (e.g., perceived coordination performance, perceived information search scope) on perceived decision quality is not uncommon while of great importance for e-commerce studies that consumers will re-patronize an e-commerce site only when they feel their decision quality has been increased for some reasons (e.g., innovative features of the website, good customer service, etc). Generally speaking, information search scope is found to be important in collaborative decision making. For example, O'Keefe and McEachern (1998) find that discussing and exchanging opinions on more products implies that shoppers can perform

a more comprehensive examination of product alternatives, thereby potentially leading to a more informed product decision.

To our best knowledge, this study makes one of the first attempts to examine the impact of various navigation supports on perceptual constructs (i.e. perceived coordination performance and perceived information search scope) that can potentially influence the perception of decision quality. The complete research model is shown in Figure 4.

Before proceeding to the hypotheses development section, we list a table to summarize the support level of those four types of navigation in common ground, situational awareness, uncoupling occurrence and information search scope respectively to help better understand the logic of our hypotheses (see Table 2).

Table 2. Summary of Support Level

Navigation Type	Common Ground	Situational Awareness	Uncoupling Occurrence	Information Search Scope
Separate navigation	Low	Low	High	High
Separate navigation with location cue	Moderate	Moderate	Low	High
Split screen navigation	Moderate	High	Moderate	Moderate
Shared screen navigation	High	High	High	Low

3.2 Hypotheses Development

3.2.1 Shared Navigation Versus Separate Navigation

Uncoupling can occur in both separate and shared navigation conditions (Zhu et al. 2010). With separate navigation support, shopping partners can search product information through their own individual browsers. In such circumstances, it is quite possible that shopping partners will encounter inter-screen uncoupling. For example, one shopper might assume incorrectly that his/her partner is staying at the same web page which he/she is examining, whereas they are actually looking at different web pages. Consequently, inter-screen uncoupling incidents may occur between shopping partners because of a perception mismatch between what they think their partners are doing and what their partners are actually doing (i.e. they do not get to know that they are not referring to the same product on a particular web page). Furthermore, because of the lack of visual common ground, shoppers with separate navigation cannot resolve an uncoupling incident easily, but have to inform each other of their current location and the product that they are examining, and based on that, coordinate their navigation with each other.

Uncoupling may occur in the shared navigation condition when both parties do not refer to the same product despite being on the same web page. In addition, uncoupling can also result of poor coordination. For example, because two browsers are strictly synchronized, one's preferred navigation could be interrupted by his/her companion's un-notified act of moving away from current content.

As for overall perceived coordination performance, the use of shared navigation is likely to reduce the occurrence of uncoupling as compared to the use of separate navigation.

When communication diverges from mutual understanding (i.e., uncoupling occurs), a shared context needs to be created (i.e., common ground) (Goffman 1981; Krauss and Fusell 1991a). Shared navigation allows people to see the same web pages synchronously all the time. These shared visual cues facilitate the establishment of their common ground which in turn reduces the occurrence of uncoupling as well as the effort spent to coordinate with each other. In addition, once uncoupling occurs, shared navigation allows shoppers to simply use pointing devices to show others the item one is looking at. Therefore, it is much easier to use shared navigation to resolve occurred uncoupling than to use separate navigation. Consequently, we propose

H1a: Shared navigation leads to lower perceived uncoupling in collaborative online shoppers, when compared to separate navigation.

H1b: Shared navigation leads to higher perceived ease of resolution in collaborative online shoppers, when compared to separate navigation.

Information search (scope) depends on both one's ability and one's motivation. (Bettman and Park 1980, Schmidt and Spreng 1996). Similarly, the ELM model suggests that both the ability to process information and the motivation to process information are necessary before someone engages in effortful cognitive processing (Petty and Cacioppo 1986). With separate navigation, shoppers are able to browse web pages independently and search for product information on their own wills. In other words, separate navigation allows shopping partners to independently examine product information that they are interested in, prior to suggesting any candidate product to their partner for collaborative evaluation. Thus, shopping partners in separate navigation may perceive a higher ability

to search product information on this website. Furthermore, once shopping partners decide to evaluate candidate products collaboratively, it is quite possible that they will mainly concentrate on those product attributes valued by at least one of them rather than all the information listed on a shared web page. Therefore, shopping partners may save more cognitive resources, and consequently form a higher level of perceived ability to search and will discuss more product alternatives.

On the contrary, with shared navigation, both shopping partners are forced to process much more product information for every product examined due to synchronized web page navigation. For example, assume that shopper 1 would like to examine attribute A while shopper 2 prefers to examine attribute B. As a result, shopper 1 and shopper 2 have to examine both attribute A and B together, even in the same pace to coordinate their navigation. This inflexibility could potentially impair shoppers' perceived ability of searching information on this website, leading to a decrease in information search activity (Schmidt and Spreng 1996). In addition, the greater the number of attributes a consumer uses to screen alternatives, the lower the number of alternatives that will be further evaluated (Widing and Talarzyk 1993). In other words, the higher information load experienced by shopping partners in the shared navigation condition may expedite the exhaustion of shoppers' cognitive resources. Therefore, shopping partners may cope with such situation by adopting simplified decision strategies, such as reduce the information considered (i.e. reduce the number of product considered) (Payne et al. 1993), rendering a lower perceived information search scope. Hence, we propose,

H1c: Shared navigation leads to lower perceived information search scope in collaborative online shoppers, when compared to separate navigation.

3.2.2 Split Screen Navigation and Separate Navigation with Location Versus Separate and shared Navigation

With separate navigation with location cue and split screen navigation, shopping partners can browse websites independently with their individual browser or personal screen. Meanwhile, with the help of location cue or shared screen, additional contextual information about shopping partners' navigation behavior is also available for them to coordinate their collaborative online shopping activity. Uncoupling may occur in separate navigation with location condition when both parties are exposed to the same web page at the same time but fail to properly coordinate their examination of focal product (i.e. intra-screen focal uncoupling). Similarly, uncoupling can also occur in split screen navigation condition when one shopper is looking at the information displayed in the shared screen side. In this case, the shared screen resembles the shared navigation condition in which intra-screen focal uncoupling as well as intra-screen navigational uncoupling are likely to occur.

In terms of overall perceived coordination performance, the use of both separate navigation with location cue and split screen navigation are likely to alleviate the occurrence of uncoupling as compared to the use of separate navigation. Specifically, shopping partners in both separate navigation with location cue and split screen navigation conditions are able to get aware of their partners' navigation state in real time, such as what product or even which part of a particular web page his/her partner is looking at. According to situation awareness theory, situation awareness can reduce effort, increase efficiency and reduce errors for the activity of collaboration (Gutwin and Greenberg, 2001). In the context of collaborative online shopping, making shopping companions aware of their partners' current navigation state enables them to understand

each other's contextual cues and is thus likely to reduce coordination effort and reduce the occurrence of various uncoupling. To resolve occurred uncoupling, one shopper only needs to inform the other to scroll down or up within a particular web page and indicate the location with the help of either separate navigation with location cue or split screen navigation support.

While situation awareness may help to reduce the occurrence of uncoupling by providing contextual cues, these contextual cues may also compete with each other for limited attention sometimes. Hence, which information people attend to has a substantial influence on their situation awareness and relevant task performance (Endsley 2000). Specifically, in shared navigation condition, shopping partners' web page navigations are always synchronized in the screen level that individual shoppers sometimes are inevitable to pay their attention to the information only favored by their shopping partners. In other words, this possibly irrelevant contextual information (e.g., could be only a piece of product information or a whole product web page) rashly seizes on individual shoppers' screens and actively competes for their attentions as suggested by situational awareness theory (Endsley 2000). Once this happens, individual shoppers may simply choose to neglect and not process this superfluous information due to limited cognitive capacity (Lamm and Trommsdorff 1973), whereas their shopping partners may falsely estimate this situation and still initiate conversations on this information, leading to the occurrence of intra-screen focal uncoupling. On the other hand, because of the strictly synchronized navigation, one shopper's preferred way of navigation may be interfered with or infringed on by the shopping partner's unannounced act of moving to a different web content. Therefore, we propose,

H2a: Split screen navigation, when compared to separate navigation, leads to lower perceived uncoupling in collaborative online shoppers.

H2b: Split screen navigation, when compared to shared navigation, leads to lower perceived uncoupling in collaborative online shoppers.

H2c: Separate navigation with location cue, when compared to separate navigation, leads to lower perceived uncoupling in collaborative online shoppers.

H2d: Separate navigation with location cue, when compared to shared navigation, leads to lower perceived uncoupling in collaborative online shoppers.

H2e: Split screen navigation, when compared to separate navigation, leads to higher perceived ease of resolution in collaborative online shoppers.

H2f: Separate navigation with location cue, when compared to separate navigation, leads to higher perceived ease of resolution in collaborative online shoppers.

H2g: Split screen navigation, when compared to shared navigation, leads to lower perceived ease of resolution in collaborative online shoppers.

H2h: Separate navigation with location cue, when compared to shared navigation, leads to lower perceived ease of resolution in collaborative online shoppers.

With the help of separate navigation with location cue and split screen navigation, consumers are able to get aware of the contextual information with regards to what product their partners are currently examining or commenting on. By clicking on the location cue bar (in separate navigation with location cue condition) or simply switching their attention to the shared screen side (in split screen navigation condition), consumers can navigate to the target product page and access to the specific information shared by their partners with less effort. In other words, the accessibility of target information

displayed on partners' screen has been greatly enhanced with the help of location cue and shared screen, and potentially lowering the information search cost (Bettman et al. 1991). As a result, this may encourage more information search activities, and consequently render a higher perceived information search scope. In addition, since we have argued that separate navigation support will lead to higher perceived information search scope as compared with shared navigation support, thereby we propose

H2i: Split screen navigation, when compared to separate navigation, leads to higher perceived information search scope in collaborative online shoppers.

H2j: Separate navigation with location cue, when compared to separate navigation, leads to higher perceived information search scope in collaborative online shoppers.

H2k: Split screen navigation, when compared to shared navigation, leads to higher perceived information search scope in collaborative online shoppers.

H2l: Separate navigation with location cue, when compared to shared navigation, leads to higher perceived information search scope in collaborative online shoppers.

3.2.3 Split Screen Navigation Versus Separate Navigation With Location Cue

Both intra-screen focal uncoupling and intra-screen navigational uncoupling could happen in split screen navigation condition only when one shopper allocates his/her attention to the shared screen side while the other one keeps examining his/her own personal screen (i.e., both parties are looking at the same web page which is synchronized). Interestingly, this is quite similar to shared navigation condition except that the shopper dwells in the shared screen cannot control anything on this screen, such

as scrolling down or up, navigating to other pages, and even highlighting information within current page. Once uncoupling occurs, shopping companions can simply rely on synchronized page navigation and use mouse cursor to highlight the item one is looking at (Zhu et al 2010).

In separate navigation with location cue condition, a derived intra-screen focal uncoupling could occur when both shopping companions do not refer to the same information despite being on the same web page (though not strictly synchronized) by clicking on the location cue bar. In this circumstance, shopping companions' common ground has been confined to a web page level. In other words, what they are sharing is actually a web page rather than a screen (i.e., a web page could be comprised of many screens depending on factors such as screen size, screen resolution and etc.) In addition, the identical location cue information received by both shopping companions may further generate an illusion that they are looking at the same product, even the same information at the same time. Consequently, this misinterpretation may increase the probability of the occurrence of intra-screen focal uncoupling. Once uncoupling occurs, consumers need to guide their partners to scroll down or up within the current shared web page and indicate the specific location. Finally, we also contend that the more complex the shared web page is, the more uncoupling shopping companions may encounter, and the more difficult to resolve these uncoupling. Therefore, we propose

H3a: Split screen navigation, when compared to separate navigation with location cue, leads to lower perceived uncoupling in collaborative online shoppers.

H3b: Split screen navigation, when compared to separate navigation with location cue, leads to higher perceived ease of resolution in collaborative online shoppers.

3.2.4 Group Structure as a Moderator

The concept of group has been frequently mentioned in the context of computer-mediated collaboration as well as real time distributed collaboration (Straus et al 2009; Sniezek and Buckley 1995; Katz and Te'eni 2007). It seems that when and where collaboration happens, group related factors will be identified and investigated from multitudinous perspectives. For example, in a study exploring judge-advisor decision making, Sniezek and Buckley (1995) find that the judge's final choice accuracy and confidence depends on its level of dependence on other advisors: the best performance by independent judges while the poorest by dependent judges. In another study investigating the relationship between group members' perspectives, contextualization, mutual understanding and relevant performance in an organizational collaboration context, Katz and Te'eni (2007) argue that contextualization increases mutual understanding and performance when group members hold different perspectives, but it does not increase mutual understanding and even decreases performance in the situations of shared perspective. Hence, it is reasonable to conclude that the effects of group related factors are always contingent, and exploring their moderating roles would be appropriate.

In this study, we apply the concept of group structure which is defined as an indication of the role combination among group members. In addition, we identify two forms of structures, namely, "co-buyer" and "main buyer/opinion giver". Specifically, in the co-buyer structure, all group members (two persons in this study) are the direct beneficiaries of a product or products collaboratively purchased. Therefore, they all actively engage in information search and evaluation process, and make final purchase decision based on preferences of all members. In contrast, in the main buyer/opinion giver structure, there is only one direct beneficiary of a product or products collaboratively purchased. Though

other members (one person in this study) also attend to information search and evaluation activities, they are supposed to provide their opinions or suggestions on those candidate products selected by the main buyer. Finally, the main buyer makes purchase decision by synthesizing self-preference as well as suggestions from opinion givers.

According to Pashler (1994), dual task interference refers to the situation where people need to perform two or more activities concurrently. As a result, the performance on either or both activities may be impaired. In the context of collaborative online shopping, shopping companions need to concurrently process new information from their partners while also processing their own information so as to contribute to the discussion. Prior research on dual task interference has indicated that dual task interference significantly reduced people's information processing and led to lower decision quality (Heninger et al 2006), and decreased performance (Chewning and Harrell 1990; Johnson and Payne 1995; Schultze and Vandenbosch 1998; Speiper and Morris 2003). A most common theoretical underpinning is that individuals have a limited cognitive capacity that can be shared among tasks, so as the demands from tasks increase beyond some point, dual task interference will occur. That is, dual task interference is likely to occur only when there are moderate or high demands for cognitive attention (Heninger et al 2006).

Dual task interference is more likely to occur when shopping companions are formed in a co-buyer structure. In a co-buyer structure, both shopping partners are inclined to actively and collaboratively engage in product information search and evaluation process. In other words, on one hand, shopping partners need to process product information displayed on their own screen and prepare for further discussion; on the other hand, they are also required to attend to new information suggested by their partners. Thereby, they are

forced to split their scarce cognitive resources between different sub-tasks. With shared navigation support, co-buyers could choose to allocate their attention to one task or the other in a sequential manner that effectively enables both tasks to be performed (Garcia-Larrea et al. 2001; Hancock et al 2003). For example, since co-buyers' screens are strictly synchronized, when shopper A is examining product X (information search), this same product X will be presented to shopper B simultaneously on B's screen. In this situation, shopper B may consider product X as either the new information suggested by shopper A or a target product that is about to be examined. In both cases, dual task interference is unlikely to occur. Furthermore, since the two shoppers are synchronized all the time in terms of navigation, sharing visual and behavior cues, and is thus likely to reduce the occurrence of uncoupling. However, with separate navigation support, shopping partners may attend to new information offered by their partners frequently. As more and more product alternatives being examined, the cognitive resources available for new information attention may decrease rapidly (Heninger et al 2006). Dual task interference then might occur when shopping partners finally neglect to process new information (Lamm and Trommsdorff 1973). Uncoupling can occur both before and after the occurrence of dual task interference. For example, when one shopper is trying to navigate to the information suggested by his/her partner, inter-screen uncoupling may occur as discussed before. Besides, when the shopper fails to attend to new information without any response, another set of inter-screen uncoupling also could be perceived. In conclusion, in the co-buyer structure, separate navigation leads to a much higher perceived uncoupling than those in shared navigation.

On the contrary, in the main buyer/opinion giver structure, opinion givers are apt to simply follow the navigation path of the main buyer as their main task is to give opinions and suggestions on those candidate products preferred by the main buyer. As a result, more cognitive resources could be saved from struggling against various uncoupling incidents and instead for product evaluation and discussion. In addition, opinion givers only need to attend to information suggested by the main buyer and process it for further interaction in a sequential order. Therefore, it is reasonable to contend that opinion givers are less likely to experience any dual task interference. Besides, although main buyers have to actively engage in both information processing and discussion, the demands for cognitive attention from needing to participate are relatively lower, posing little chance of dual task interference (Heninger et al 2006). Shared navigation allows opinion givers to follow the main buyer's navigation path tightly throughout the whole online shopping process and they are able to view the same web contents synchronously. These shared visual and behavioral cues could potentially enhance shoppers' awareness of each other's situations and their common ground (Kraut et al. 2003), which helps in reducing the occurrence of uncoupling. As for separate navigation condition, although inter-screen uncoupling also occurs between main buyers and opinion givers, the desire of being together makes shopping partners tend to update their shopping information to each other more frequently to avoid any occurrence of uncoupling ahead. In general, separate navigation leads to a bit higher perceived uncoupling than those in shared navigation. Therefore, we propose

H4a: The superiority of shared navigation over separate navigation in terms of perceived uncoupling will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyer structure.

In the co-buyer structure, the final purchase decision is made based on preferences of all group members. This intrinsic motivation will induce a stronger feeling of involvement in this collaborative online shopping task from co-buyers. Meanwhile, co-buyers also understand that they are going to make purchase decision not only based on their own preference, but need to take other members' preferences into consideration as well. Thus, the group choice rules are not solely centered on their own, but on all the group members as a whole. Therefore, a set of more complicated choice rules will be developed in co-buyer groups. Consumer behavior research has contended that consumers engage in more searches when involvement is high and less search when involvement is low (Engel et al. 1993; Hawkins et al. 1986; Howard and Sheth 1969). Prior research on consumer information search also found that the amount of information desired will be influenced by the choice rule the consumer uses, such that the more complicated the rule is, the more information will be required (Spreng and Olshsavsky 1989). Therefore, co-buyers are likely to search for and process more product information as compared with main buyer and opinion givers.

Separate navigation enhances shopping partners' ability to search for and process product information on a website. Specifically, when formed in a co-buyer structure, shopping partners are going to search for a greater amount of information with separate navigation support than with shared navigation. However, when grouped in a main buyer/opinion

giver structure, the amount of information searched for and processed in separate navigation is similar to those in shared navigation, if not a little more. Hence, we propose

H4b: The superiority of separate navigation over shared navigation in terms of perceived information search scope will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyer structure.

The need to interact introduces dual task interference (Heninger et al 2006). As demonstrated before, when formed in the co-buyer structure, shopping partners (i.e., co-buyers) using separate navigation tend to process new information from others for interaction purpose. Specifically, if one shopper decides to process the incoming new information, he/she first needs to direct his/her cognitive focus to the new information. Unfortunately, with separate navigation support, it is arduous for him/her to navigate over and attend to this new information. For instance, he/she needs to frequently inform his/her partner of his/her current location so as to adjust the navigation path until arrival. During this process, inter-screen uncoupling may occur and a great amount of cognitive resources will be wasted to resolve them. Besides, when finally the shopper attends to this information, processing it also requires cognitive resources. Therefore, the more product information the shopper examined (no matter where the information comes from), the fewer cognitive resources the shopper left. Dual task interference then occurs when the shopper neglects to process new information (Lamm and Trommsdorff 1973). Therefore, as discussed before, uncoupling could occur frequently in separate navigation condition when shopping partners are formed in a co-buyer structure. On the contrary, by using separate navigation with location cue or split screen navigation, co-buyers can quickly attend to the new information by either clicking on the location cue bar or simply

switch their attention to the shared screen side. This efficient shift indicates that the demands for cognitive attention from needing to participate is low, thus dual task interference is less likely to happen. In terms of perceived uncoupling, both separate navigation with location cue and split screen navigation support an appropriate amount of situation awareness information to help to reduce the occurrence of various uncoupling incidents. In conclusion, when grouped in a co-buyer structure, separate navigation leads to a much higher perceived uncoupling than those in separate navigation with location cue and split screen navigation.

As discussed before, in a main buyer/opinion giver structure, both the main buyer and opinion giver are not susceptible to dual task interference. In addition, separate navigation with location cue as well as split screen navigation can provide a suitable amount of real time awareness information regarding shopping partners' navigation state, such as which product/web page they are looking at and what information they are examining. This stream of awareness information helps shopping companions understand each other's contextual cues and is thus likely to reduce coordination effort and alleviate the occurrence of various uncoupling. In separate navigation condition, inter-screen uncoupling could occur. Whereas the desire of following increases the frequency of location update which may potentially reduce the occurrence of uncoupling as well. In general, separate navigation leads to a bit higher perceived uncoupling than those in separate navigation with location cue and split screen navigation. Therefore, we propose

H5a: The superiority of split screen navigation over separate navigation in terms of perceived uncoupling will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyer structure.

H5b: The superiority of separate navigation with location cue over separate navigation in terms of perceived uncoupling will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyer structure.

3.2.5 Impact of Coordination Performance and Perceived Information search scope

To further understand the influences of perceived coordination performance and perceived information search scope, it is important to investigate whether or not these constructs indeed affect consumers' perceived decision quality. Perceived decision quality is a subjective indication of how a decision maker perceives his/her decision to be accurate, correct, precise, and reliable (Mennecke and Valacich 1998).

Improved coordination performance save more effort and time for shoppers to share and discuss the product information (Zhu et al. 2010), and make the shopping process more smooth and efficient, thereby more product alternatives can be collectively examined thoroughly, and potentially leading to higher perceived decision quality. Therefore, we posit

H6: Perceived uncoupling negatively influences perceived decision quality.

H7: Perceived ease of resolution positively influences perceived decision quality.

Discussing and exchanging opinions on more products implies that shoppers can perform a more thorough examination of displayed product alternatives, thereby potentially leading to a more-informed product decision (O'keefe and McEachern 1998). In contrast, insufficient or ineffective interactions will reduce team's iterations on the end product, and as a result, the quality will suffer. Hence, we posit

H8: Perceived information search scope positively influences perceived decision quality.

4. Research Method

The hypotheses proposed in the present study were tested through a laboratory experiment with a 4×2 full factorial design (i.e., 4 types of navigation support ×2 types of group structure). The four types of navigation support include: (1) separate navigation, (2) separate navigation with location cue, (3) split screen navigation, and (4) shared navigation. The group structure (co-buyer vs. main buyer/opinion giver) was manipulated by asking each pair of subjects to assign roles to themselves after a short discussion (i.e., both subjects were buyers with equal power in co-buyer condition; while in main buyer/opinion giver condition, one subject was the main buyer while the other one was theopinion giver).

4.1 Experimental Procedures

A total of 70 subjects were recruited from a Southeast Asian university campus and randomly assigned to the eight groups (i.e., 4 navigation support condition × 2 group structure type), with roughly equal group size.

We provide subjects with a benchmark to evaluate particular hotel booking experience based on adaptation theory (Helson 1964), which suggests that people's judgment are based on (1) the sum of their past experiences, (2) the context and background of a particular experience, and (3) a stimulus. In the experiment, we randomly assigned subjects to different treatment conditions to ensure that the sum of the subjects' past experiences were homogeneous across conditions. Additionally, as long as a common benchmark was provided to all the subjects, we could be confident that the context and

background of their experimental experiences were equivalent, such that the differences across different conditions were caused solely by different treatment stimuli.

Therefore, before the subjects proceeded to the main task in their assigned conditions, they were asked to perform a brief training task (i.e., book a hotel room in New York City) with separate navigation support. The subjects were asked to treat the experiences of training task as benchmarks against which to judge the main task experiences. Each pair of subjects (two subjects were allocated in different office rooms) were then directed to an assigned navigation support condition, and asked to examine hotel information collaboratively as if they/one of them were/was planning an overseas trip and would like to choose a hotel room to stay in. After finishing hotel selection, the subjects completed questionnaires and were paid $15 each as a participation reward.

5. Data Analysis

5.1 Subject Background Information and Manipulation Check

The 70 subjects came from diverse academic backgrounds, such as business, engineering, arts and science. 28 were males and 42 were females, aging from 19 to 28.

No significant differences were found between subjects randomly assigned to each of the eight experimental conditions with respect to age, gender, online shopping experience and social intimacy. All these evidence indicate that participants' demographics were quite homogeneous across different conditions.

A notable difference between co-buyer and main buyer/opinion giver is observed ($F(1, 68) = 91.5$, $p<.001$) by asking the following questions:

- *The entire hotel booking process was primarily dominated by only one of us.*
- *Both of us contributed equally to lead the hotel search process.*

Therefore, the manipulation check for group structure is successful.

5.2 Results on Perceived Uncoupling

The Cronbach alpha of perceived uncoupling is 0.75, though slightly above 0.70, still generally acceptable for adequate internal consistency.

ANOVA was conducted to examine the effects of navigation supports and on perceived coordination performance and perceived information search scope. Corresponding results are shown in Table 1 and Table 2. Specifically, Table 1 shows that the effect of navigation support on perceived uncoupling is significant, while group structure effect and the interaction effect are not significant. In order to further examine my hypotheses, post hoc analysis by adapting the Tukey test was conducted (see Table 2), and it reveals:

(1) separate navigation with location cue effectively reduces people's perception of the frequency of uncoupling as compared to split screen navigation. Surprisingly, this finding is inconsistent with the idea delivered in H3a. Therefore, H3a is not supported; (2) shared navigation and separate navigation are not really different from each other in terms of reducing perceived uncoupling, thus rejecting H1a; (3) though separate navigation with location cue is significantly different from split screen navigation as mentioned in (1), they are not statistically different from either separate navigation or shared navigation in affecting perceived uncoupling, thus rejecting H2a, H2b, H2c and H2d; (4) the interaction effect is not significant, indicating that the superiority of shared navigation over separate navigation is not different, regardless of the particular group structure applied, thus failing to support H4a. Similarly, H5 and H5b are also not supported. These effects are shown in Figure 5.

Table 3. ANOVA Summary Table for Perceived Uncoupling

Source	df	Mean Square	F	Sig.
Between-Subjects				
Navigation Support	3	2.25	2.99	**.037**
Group Structure	1	1.25	1.67	.202
Navigation Support * Group Structure	3	.112	.149	.930

Table 4. Results on Perceived Uncoupling : Multiple Comparisons

(I) group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower bound	Upper bound
1 separate navigation	2	.5370	.282	.236	-.20	1.28
Mean: 2.203	3	-.2407	.289	.839	-1.00	.52
	4	.2513	.309	.848	-.56	1.07
2 separate with location cue	1	-.5370	.281	.236	-1.28	.21
	3	-.7778*	.281	.037	-1.52	-.03
Mean: 1.667	4	-.2857	.302	.780	-1.08	.51
3 split screen	1	.2407	.289	.839	-.52	1.00
Mean: 2.444	2	.7778*	.282	.037	.03	1.52
	4	.4921	.309	.390	-.32	1.30
4 shared screen	1	-.2513	.309	.848	-1.07	.56
Mean: 1.952	2	.2857	.302	.780	-.51	1.08
	3	-.4921	.309	.390	-1.30	.32

5.3 Results on Perceived Ease of Uncoupling Resolution

ANOVA on perceived ease of uncoupling resolution suggests that navigation supports do not significantly affect perceived ease of uncoupling resolution (see Table 3). In order to further test my hypotheses, post hoc analysis based on Tukey test reveals (see Table 4): (1) shared navigation and separate navigation are not different from each other in affecting perceived ease of uncoupling resolution, thus rejecting H1b; (2) separate navigation with location cue and split screen navigation are not different from both shared navigation and separate navigation in affecting perceived ease of uncoupling resolution, thus rejecting H2e, H2f, H2g and H2h; (3) split screen navigation and separate navigation with location cue are not different from each other in affecting perceived ease of uncoupling resolution. There effects are shown in Figure 6.

Table 5. ANOVA Summary Table for Perceived Ease of Uncoupling Resolution

Source	df	Mean Square	F	Sig.
Between-Subjects Navigation Support	3	.323	.508	.678

Table 6. Results on Perceived Ease of Uncoupling Resolution: Multiple Comparisons

(I) group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower bound	Upper bound
1 separate navigation **Mean: 5.833**	2 3 4	.0333 -.2407 .0476	.259 .266 .284	.999 .802 .998	-.64 -.94 -.70	.72 .46 .7965
2 separate with location cue **Mean: 5.800**	1 3 4	-.0333 -.2741 .0143	.259 .259 .278	.999 .716 1.000	-.71 -.96 -.71	.65 .41 .75
3 split screen **Mean: 6.074**	1 2 4	.2407 .2741 .2884	.266 .259 .284	.802 .716 .741	-.46 -.41 -.46	.94 .96 1.04
4 shared screen **Mean: 5.786**	1 2 3	-.0476 -.0143 -.2884	.284 .278 .284	.998 1.000 .741	-.80 -.75 -1.04	.70 .72 .46

5.4 Results on Perceived Information Search Scope

ANOVA on perceived information search scope suggests that navigation supports significantly affect perceived information search scope, while the interaction effect is not significant (see Table 5). The absence of interaction effects indicates that the effect of navigation support on perceived information search scope is not moderated by group structure. Thus, H4b is not supported. Post hoc analysis based on Tukey test reveals (see Table 6): (1) shared navigation is associated with significantly lower perceived information search scope than separate navigation, thus supporting H1c; (2) separate navigation with location cue and split screen navigation enable a higher perceived information search scope as compared to shared navigation but not separate navigation, thus H2i and H2j are not supported, while H2k and H2l are supported. See Figure 7 for more details.

Table 7. ANOVA Summary Table for Perceived Information Search Scope

Source	df	Mean Square	F	Sig.
Between-Subjects				
Navigation Support	3	9.70	10.4	**.000**
Group Structure	1	.53	.569	.454
Navigation Support * Group Structure	3	1.04	1.12	.349

Table 8. Results on Perceived Information Search Scope: Multiple Comparisons

(I) group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower bound	Upper bound
1 separate navigation	2	-.3931	.314	.596	-1.22	.44
Mean: 5.069	3	.0972	.322	.990	-.75	.95
	4	1.4623*	.344	.000	.55	2.37
2 separate with location cue	1	.3931	.314	.596	-.44	1.22
	3	.4903	.314	.407	-.34	1.32
Mean: 5.463	4	1.8554*	.336	.000	.97	2.74
3 split screen	1	-.0972	.322	.990	-.95	.75
Mean: 4.972	2	-.4903	.314	.407	-1.32	.34
	4	1.3651*	.344	.001	.46	2.27
4 shared screen	1	-1.4623*	.344	.000	-2.37	-.55
Mean: 3.607	2	-1.8554*	.336	.000	-2.74	-.97
	3	-1.3651*	.344	.001	-2.27	-.46

5.5 Impacts on Perceived Decision Quality

SmartPLS 2.0 was used to test the structural model proposed on the right part of Figure 7. The measurement model was first assessed by examining the followings (1) item reliability, (2) internal consistency, and (3) discriminant validity (Barclay et al 1995). All the measurement items generally load well on their respective constructs, with loading above 0.7 (see Table 7). Decent composite reliability and Cronbach alpha scores well support internal consistency (see Table 8).

The diagonal elements in Table 8 represent the square roots of average variance extracted (AVE) of latent variables, while the off-diagonal elements are the correlations between latent variables. According to the criteria of discriminant validity, the square root of the AVE of any latent variable should be greater than the correlation between this particular latent variable and other latent variable (Barclay et al 1995). Data shown in Table 8 satisfy this requirement. Moreover, the loadings of items on their respective latent variables are higher than that of other items on these latent variables and the loadings of these items on other latent variables, which further verify discriminant validity.

Bootstrap re-sampling was performed on the structural model to examine path significance. Results shown in Figure 8 suggest that perceived ease of uncoupling resolution and perceived information search scope have a significant and positive effect on perceived decision quality ($p<.05$), thus H7 and H8 are supported. However, perceived uncoupling has a negative but insignificant effect on perceived decision quality, thus H6 is rejected.

Table 9. Loadings and Cross-Loadings of Measures

	Group Structure	Perceived Information Search Scope	Perceived Decision Quality	Perceived Uncoupling	Perceived Ease of Uncoupling Resolution
GrStrucure 1	**0.86**	-0.10	-0.13	0.18	-0.01
GrStrucure 2	**0.92**	-0.06	-0.30	0.02	-0.01
PerSScope 1	-0.01	**0.75**	0.17	-0.20	-0.06
PerSScope 2	-0.11	**0.87**	0.27	-0.21	0.05
PerSScope 3	-0.03	**0.88**	0.20	-0.09	0.20
PerSScope 4	-0.07	**0.71**	0.20	-0.01	0.02
PerDQuality 1	-0.30	0.18	**0.90**	-0.13	0.24
PerDQuality 2	-0.14	0.23	**0.76**	-0.04	0.14
PerDQuality 3	-0.23	0.31	**0.93**	-0.18	0.18
PerDQuality 4	-0.23	0.21	**0.90**	-0.11	0.24
PerUncoupling 1	-0.11	-0.10	-0.12	**0.80**	-0.01
PerUncoupling 2	0.04	-0.06	-0.10	**0.80**	-0.17
PerUncoupling 3	0.01	-0.24	-0.11	**0.84**	-0.13
PerEUResolution 1	0.01	0.14	0.12	0.02	**0.71**
PerEUResolution 2	0.06	-0.03	0.21	-0.17	**0.81**
PerEUResolution 3	0.12	0.08	0.13	-0.04	**0.72**

Table 10. Internal Consistency and Discriminant Validity of Constructs

	Composite Reliability	Cronbach's Alpha	Perceived Information Search Scope	Perceived Decision Quality	Perceived Uncoupling	Perceived Ease of Uncoupling Resolution
Perceived Information Search Scope	0.87	0.80	**0.62**			
Perceived Decision Quality	0.93	0.90	0.27	**0.77**		
Perceived Uncoupling	0.86	0.75	-0.17	-0.14	**0.67**	
Perceived Ease of Uncoupling Resolution	0.76	0.72	0.06	0.23	-0.12	**0.61**

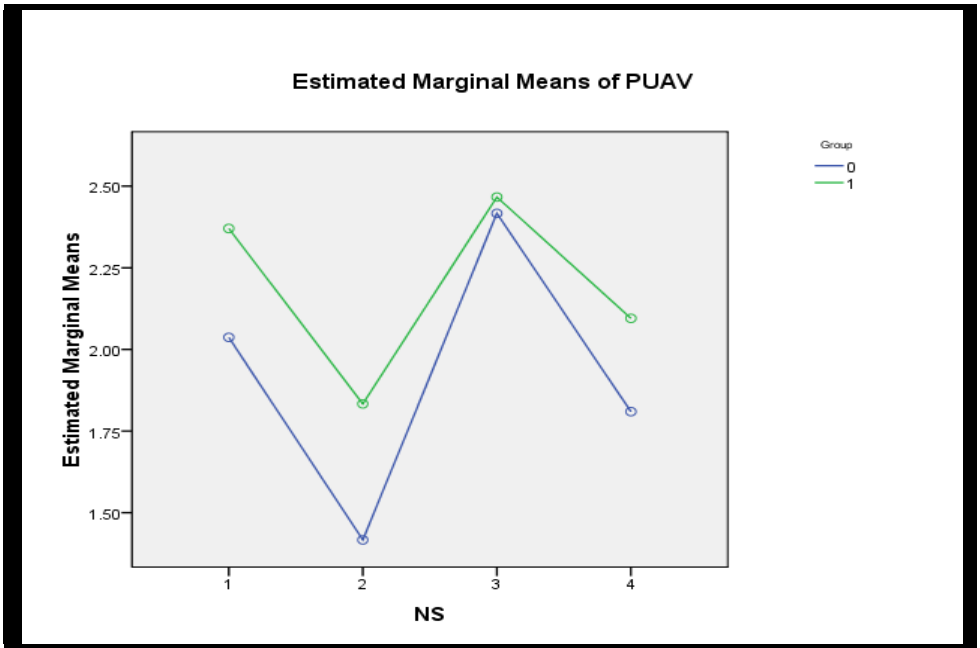

Figure 5. Results on Perceived Uncoupling

Note: In group category, 0 stands for co-buyer condition, and 1 stands for main buyer/follower condition. For the horizontal axis, 1 stands for separate navigation, 2 stands for separate navigation with location cue, 3 stands for split screen and 4 stands for shared navigation. NS is short for navigation support.

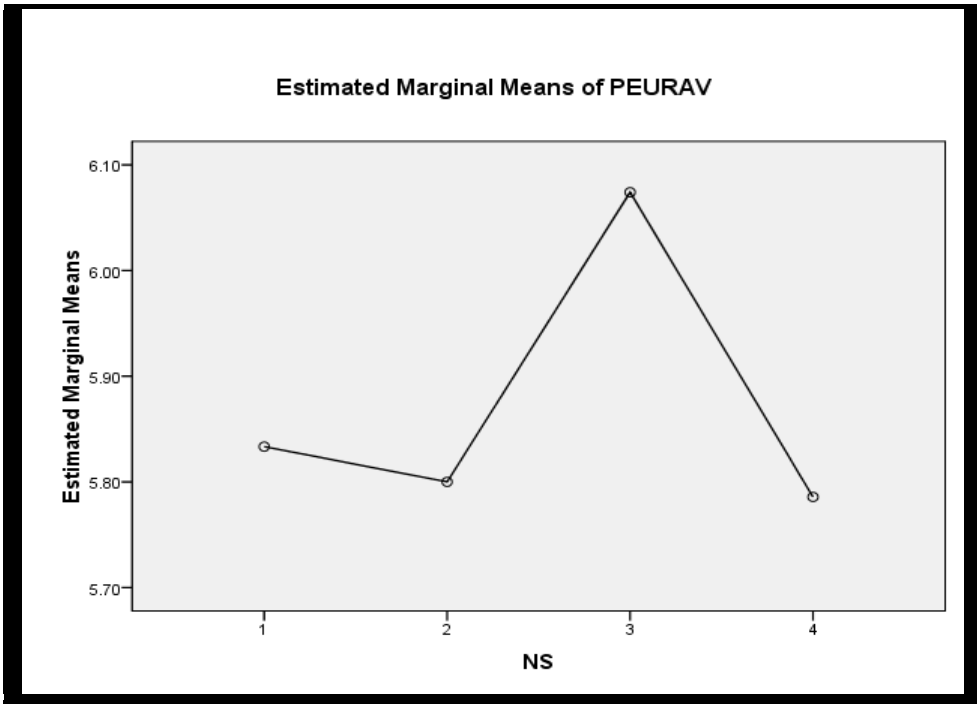

Figure 6. Results on Perceived Ease of Uncoupling Resolution

Note: For the horizontal axis, 1 stands for separate navigation, 2 stands for separate navigation with location cue, 3 stands for split screen and 4 stands for shared navigation. NS is short for navigation support.

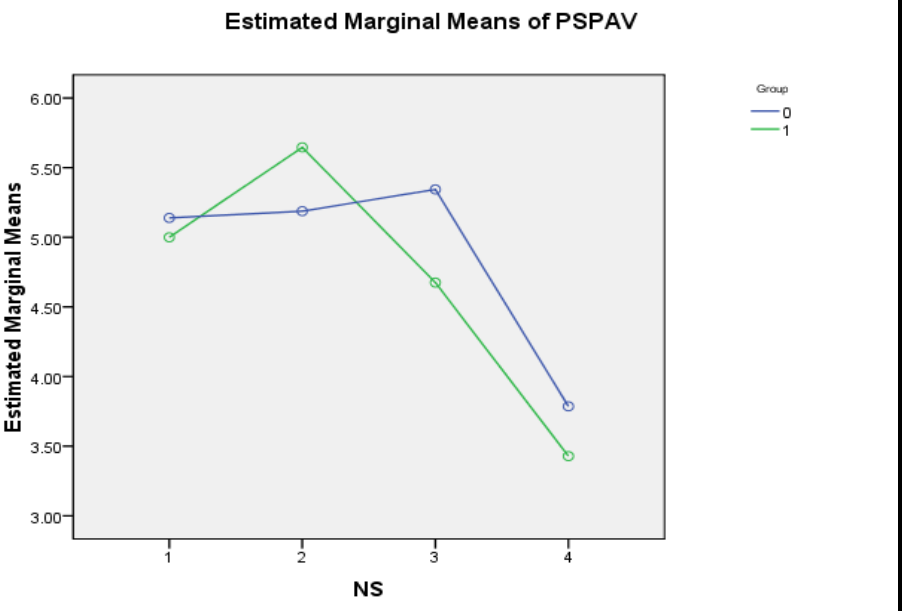

Figure 7. Results on Perceived Information Search Scope

Note: In group category, 0 stands for co-buyer condition, and 1 stands for main buyer/follower condition. For the horizontal axis, 1 stands for separate navigation, 2 stands for separate navigation with location cue, 3 stands for split screen and 4 stands for shared navigation. NS is short for navigation support.

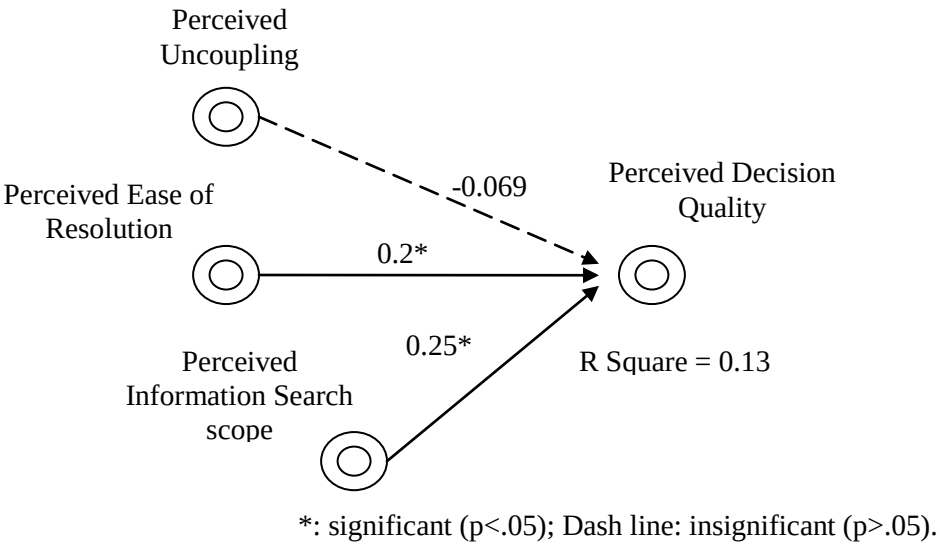

Figure 8. Regression Testing

Table 11. Hypotheses Resting Results Summary

Hypotheses	Supported?		
	Perceived Uncoupling	**Perceived Ease of Uncoupling Resolution**	**Perceived Information Search Scope**
H1: Superiority of shared navigation over separate navigation	N	N	Y
H2: Superiority of separate navigation with location cue and split screen over separate navigation and shared navigation	N	N	Partially, separate navigation with location cue and split screen is better than shared navigation.
H3: Split screen VS. separate navigation	N, separate navigation with location is better than split screen.	N	N/A
H4: The moderating effect of group structure on the comparison between shared navigation and separate navigation	N	N/A	N
H5: The moderating effect of group structure on the comparison between split screen and separate navigation with location cue	N	N/A	N/A
H6: Perceived uncoupling→Perceived decision quality	N		
H7: Perceived ease of uncoupling resolution→ Perceived decision quality	Y		
H8: Perceived information search scope→ Perceived decision quality	Y		

Note: N/A means relationships that are not tested in this study.

6. Discussion and Concluding Remarks

6.1 Discussion of Results

Although the final results does not support some of the hypotheses proposed, this study contributes to both academic research and practical design science by uncovering some interesting and insightful findings.

This study takes two perspectives, namely, perceived coordination performance and perceived information search scope, to characterize consumer's perception during collaborative online shopping process. Previous work has investigated the effect of navigation support (i.e., shared navigation and separate navigation) on consumer's coordination performance and social presence. In particular, Zhu (2010) and her colleagues found that shared navigation reduces the occurrence of uncoupling as compared to separate navigation. In the contrary, this study does not provide any evidence to show that shared navigation outperforms separate navigation in reducing consumer's perceived uncoupling. In fact, as part of post hoc analysis, we also analyzed coordination performance by adopting the same coding scheme as Zhu (2010) suggested in their paper. The result showed similar pattern, but not significantly different from each other (maybe due to insufficient sample size). Therefore, it is reasonable to contend that there is a gap between people's perception and reality. One possible explanation for the existence of this gap in collaborative online shopping context is that shopping partners could gradually get used to those frequent uncoupling incidents and become more capable of resuming from them. Once they are skillful enough to cope with it, they will not consider it as an uncoupling anymore (researchers still consider it as an uncoupling).

Prior to the experiment, we expected split screen navigation will lead to a lower perceived uncoupling than separate navigation with location cue based on the common ground theory (Clark and Brennan, 1991). Both navigation supports are able to provide some amount of situational information with regards to shopping partner's browsing contents to help establish necessary common ground for collaboration. Since split screen can deliver richer situational information, it is straightforward to prefer split screen to separate navigation with location cue in reducing perceived uncoupling. Surprisingly, the result shows an opposite pattern, thus separate navigation with location cue leads to a lower perceived uncoupling. After watching the recorded experiment video, I found that those subjects in split screen condition switch their attention from one browser to the other more frequently. This process may introduce dual task interference and increase perceived uncoupling. This finding indicates that situational information delivered by split screen sometimes is still too rich to mitigate perceived uncoupling. Besides, it also opens a door for design science researchers to think about how to balance the provision of situational information and the introduction of dual task interference. For example, we could redesign the size of both screens for split screen navigation tool, making the personal screen larger, while cutting the size of the shared screen.

This study also tries to investigate the effect of various navigation supports on perceived ease of uncoupling resolution. The result shows that the four types of navigation supports are not different from each other in affecting perceived ease of uncoupling resolution. The possibility for this insignificance will be discussed. During the experiment, subjects were allowed to communicate with each other through microphone or text chat box. In this case, subjects may falsely deem these communication tools as part of the navigation

support. Moreover, these two communication tools can play a very effective and efficient role in resolving perceived uncoupling. Hence, with the help of communication tools, subjects are not able to distinguish the difference caused by navigation supports. In other words, the potential significant effect of navigation supports on perceived ease of uncoupling resolution is covered by the effect of communication tools.

6.2 Theoretical Contribution

This study examines the effects of various navigation supports on consumers' perceived coordination performance, perceived information search scope, as well as the moderating role of the group structure. We have identified and compared four types of navigation supports (i.e., separate navigation, separate navigation with location cue, split screen navigation and shared navigation). To our best knowledge, this study makes one of the first contributions in information systems research by providing such a comprehensive investigation of various navigation supports on consumers' perceptions of coordination performance and information search scope. Specifically, we found that 1) shared navigation leads to lower perceived information search scope than separate navigation, separate navigation with location cue and split screen navigation; 2) separate navigation with location cue leads to lower perceived uncoupling than split screen navigation. Since both of these two navigation supports can provide certain amount of situational awareness information for collaborative online shoppers to facilitate collaboration, and the split screen can provide even richer amount, it implies that the amount of situational awareness information delivered by separate navigation with location cue is the ideal one if not the best. This finding supports the argument in situational awareness theory that

excessive situational awareness information may actually hamper collaboration performance. 3) It is consumers' perceived ease of uncoupling resolution and perceived information scope that has an influence on their perceived decision quality rather than perceived uncoupling.

Previous research on collaborative online shopping investigated the effects of separate navigation and shared navigation on actual coordination performance (Zhu et al 2010). In this experiment study, Zhu and her colleagues found that shared navigation led to a less occurrence of uncoupling incidents and was able to resolve occurred uncoupling more efficiently as compared to separate navigation. Nevertheless, there has been a lack of substantial IS studies that investigated separate navigation with location cue and split screen navigation, despite that some commercial websites have already launched their own website navigation support tools with similar features. This study contributes to this knowledge gap by considering the four types of navigation support in one comparison set and by applying theories on common ground, situation awareness to explore the differences between these navigation supports.

In the present study, we analyze group characteristics by choosing a structure perspective. In the context of collaborative online shopping, consumers in a main buyer/opinion giver structure perceive less uncoupling incidents in shared navigation than those in separate navigation, while consumers in a co-buyer structure also perceive less uncoupling incidents in shared navigation than those in separate navigation, but the two perception distance are different. This study draws on dual task interference theory and literatures on consumer information search to justify the moderating effects of group structure.

6.3 Limitation

The study is subject to several limitations. First, the effects of navigation support may be alleviated by introducing both voice chat and text chat in the experiment. For example, when we were investigating the effect of navigation support on consumers' perceived ease of resolution, we found no significant difference between various navigation supports. One possibility is that subjects were allowed to use voice chat to communication with each other, which potentially decreased the difficulties to resolve uncoupling, and thus giving rise to a consistent perception regarding the ease of uncoupling resolution. This conjecture receives some supporting evidence from prior studies on communication. For instance, verbal cues (e.g., tone of voice) and texts (e.g., the spoken words themselves) are faster and more accurate to send and receive (Walther 1992), and if they are removed, it can take longer and be more difficult to fully understand a message.

Besides, this study only looks into a two-shopper situation which may also limit its contribution to a relative small scope. In real life, it is natural that people tend to shop in groups of more than two people. Nevertheless, given that group of two persons has been widely considered as one of the most common combinations, this study still provides insightful and interesting findings to advance IS research.

References

Ahuja, M. K., B. Gupta, and P. Raman (2003). An empirical investigation of online consumer purchasing behavior. Communications of the ACM, 46 (12), 145-151.

Ballard, D. I., and D. R. Seivold (2004). Communication-related organizational structure and work group temporal experiences: The effects of coordination method, technology type, and feedback cycle on members' construals and enactments of time. Communication Monographs, 71 (1), 1-27.

Baltes, B. B., M. W. Dickson, M. P. Sherman, C. C. Bauer, and J. S. LaGanke (2002). Computer-mediated communication and group decision making: A meta-analysis. Organizational Behavior and Human Decision Processes, 87 (1), 156-179.

Barclay, D,. Thompson, R., and Higgins, C. "The partial least squares (PLS) approach to causal modeling: personal computer adoption and use as illustration," Technology Studies (2:2), 1995, pp.285-309.

Bargh, J. A., S. Chaiken, R. Govender, and F. Pratto (1992). The generality of the automatic attitude activation effect. Journal Personality of Social Psychology, 62 (6), 893-912.

Benbasat, I. (2010). HCI Research: Future Challenges and Directions. AIS Transactions on Human-Computer Interaction, 2(2), 16-21.

Bettmanm, James R. (1979). An information processing theory of consumer choice. Reading, MA: Addition-Wesley.

Butler, B. S. (2001). Membership size, communication activity, and sustainability: A resource-based model of online social structures. Information Systems Research, 12(4), 346-362.

Carlson, J. R., and R. W. Zmud (1999). Channel expansion theory and the experiential nature of media richness perceptions. Academy of Management Journal, 42 (2), 153-170.

Carroll, J. M., D. C. Neale, P. L. Isenhour, M. B. Rosson, and D. S. McCrickard (2003). Notification and Awareness: Synchronizing Task-oriented Collaborative Activity. Internation Journal of Human-Computer Studies, 58(5), 605–632.

Carroll, J. M., M. B. Rosson, U. Farooq, and L. Xiao (2009). Beyond being aware. Information and Organization, 19, 162-185.

Chen, Y., and J. Xie (2008). Online consumer review: Word-of-mouth as a new element of marketing communication mix. Management Science, 54 (3), 477-491.

Choi, S. Y., H. Lee, and Y. Yoo (2010). The impact of information technology and transactive memory systems on knowledge sharing, application, and team performance: A field study. MIS Quarterly, 34 (4), 855-870.

Clark, H.H. (1996). Using language. Cambridge University Press, New York.

Clark, H.H., and S.E. Brennan (1991). Grounding the communication. S. D. Teasley, ed. Perspectives on Socially Shared Cognition. APA, Washington, DC, 127–149.

Cyr, D., M. Head, H. Larios, B. Pan (2009). Exploring human images in website design: A multi-method approach. MIS Quarterly, 33 (3), 539-566.

Daft, R. L. and R. H. Lengel (1986). Organizational information requirements, media richness and structural design. Management Science, 32 (5), 554-571.

Daft, R. L., R. H. Lengel, and L. K. Trevino (1987). Message equivocality, media selection, and manager performance: Implications for information systems. MIS Quarterly, 11 (3), 355-366.

Daft, R. L., and N. B. Macintosh (1981). A tentative exploration into the amount and equivocality of information processing in organizational work units. Administrative Science Quarterly, 26, 554-571.

Dennis, A. R. (1996). Information exchange and use in group decision making: You can lead a group to information, but you can't make it think. MIS Quarterly, 20 (4), 433-457.

Dennis, A. R., and B. Reinicke (2004). Beta versus VHS and the acceptance of electronic brainstorming technology. MIS Quarterly, 28 (1), 1-20.

Dennis, A. R., and J. S. Valacich (1999). Rethinking media richness: Towards a theory of media synchronicity. In Proceedings of the 32nd Hawaii International Conference on System Sciences.

Dennis A. R., R. M. Fuller, and J. S. Valacich (2008). Media, tasks, and communication processes: A theory of media synchronicity. MIS Quarterly, 32 (3), 575-600.

Dourish, P. and V. Bellotti (1992). Awareness and coordination in shared workspaces. In Proceedings of the 1992 ACM conference on Computer-supported cooperative work. ACM Press New York, NY, USA, 107-114.

Duan, W., B. Gu, A. B. Whinston (2008). Do online reviews matter? An empirical investigation of panel data. Decision Support Systems, 45, 1007-1016.

Endsley, M. R and Garland D.J (Eds.) (2000) Situation awareness analysis and measurement. Mahwah, NJ: Lawrence Erlbaum Associates,

Engel, James F., Roger D. Blackwell, and Paul W. Miniard. (1993). Understanding the consumer, seventh Ed. Fort worth, TX: Dryden.

Evans, K. R., T. Christiansen, and J. D. Gill (1996). The impact of social influence and role expectations on shopping center patronage intentions. Journal of The Academy of Marketing Science, 24 (3), 208-218.

Farnham, S., M. Zaner, L. Cheng (2001). Supporting sociability in a shared browser. In Proceedings of Interact 2001. Zurich, Switzerland.

Gibson, C. B. (2001). From knowledge accumulation to accommodation: Cycles of collective cognition in work groups. Journal of Organizational Behavior, 22, 121-134.

Gibson, C. B., and P. C. Earley (2007). Collective cognition in action: Accumulation, interaction, examination, and accommodation in the development and operation of group efficacy beliefs in the workplace. Academy of Management Review, 32 (2), 438-458.

Goffman, E. Forms of Talk, University of Pennsylvania Press, Philadelphia, PA, 1981.

Goswami, S., C.H. Tan, and H.H. Teo (2007). Exploring the Website Features that can Support Online Collaborative Shopping. In Proceedings of 11th Pacific-Asia Conference on Information Systems, July 4-6, 2007. Auckland, New Zealand.

Graetz, K. A., E. S. Boyle, C. E. Kimble, P. Thompson, and J. L. Garloch (1998). Information sharing face-to-face, tele-conferencing, and electronic chat groups. Small Group Research, 29 (6), 714-743.

Gutwin, C. and S. Greenberg (2002). A descriptive framework of workspace awareness for real-time groupware. Computer Supported Cooperative Work, 11, 411-446.

Hargadon, A. B., and B. A. Bechky (2006). When collections of creatives become creative collectives: A field study of problem solving at work. Organization Science, 17 (4), 484-500.

Harrison, D. A., S. Mohammed, J. E. McGrath, A. T. Floret and S. W. Vanderstoep (2003). Time matters in team performance: Effects of member familiarity, entrainment, and task discontinuity on speed and quality. Personnel Psychology, 56, 633-669.

Hassanein, K., and M. Head (2007). Manipulating perceived social presence through the web interface and its impact on attitude towards online shopping. International Journal of Human-Computer Studies, 65 (8), 689-708.

Haubl, G., and V. Trifts (2000). Consumer decision making in online shopping environments: The effects on interactive decision aids. Management Science, 19 (1), 4-15.

Hawkins, Del I., Roger J. Best, and Kenneth A. Coney. (1986). Consumer behavior strategy: implication for marketing strategy. Plano, TX: Business Publication.

He, J., B. S. Butler, and W. R. King (2007). Team cognition: Development and evolution in software project teams. Journal of Management Information Systems, 24 (2), 261-292.

Howard, John A. and Jagdish N. Sheth. (1969). The theory of buyer behavior. New York: John Wiley.

Huang, P., N. H. Lurie, and S. Mitra (2009). Searching for experience on the Web: An empirical examination of consumer behavior for search and experience goods. Journal of Marketing, 73, 55-69.

Internet Retailer (2010). Social shopping tool helps drive 15% increase in sales at a skincare site. http://www.internetretailer.com/2010/03/23/social-shopping-tool-helps-drive-15-increase-in-sales-at-a-skin. Accessed on Feb 10, 2011.

Jiang, Z., I. Benbasat (2007a). Investigating the influence of the functional mechanisms of online product presentations. Information Systems Research, 18 (4), 454-470.

Jiang, Z., I. Benbasat (2007b). The effects of presentation formats and task complexity on online consumers' product understanding. MIS Quarterly, 31 (3), 475-500.

Jiang, Z., J. Chan, B. C. Y. Tan, W. S. Chua (2010). Effects of interactivity on website involvement and purchase intention. Journal of the Association for Information Systems, 11 (1), 34-59.

Jonas, K., M. Diehl, and P. Bromer (1997). Effects of attitudinal ambivalence on information processing and attitude-intention consistency. Journal of Experimental Social Psychology, 33, 190-210.

Kahn, Barbara E., and Leigh McAlister (1997). Grocery Revolution: The New Focus on the Consumer. Reading, MA: Addison-Wesley.

Karakaya, F., and N. G. Barnes (2010). Impact of online reviews of customer care experience on brand or company selection. Journal of Consumer Marketing, 27 (5), 447-457.

Kerr, N. L., and R. S. Tindale (2004). Group performance and decision making. Annual Review of Psychology, 55, 623-655.

Kiecker, P., and C. L. Hartman (1993). Purchase pal use: Why buyers choose to shop with others. In 1993 AMA Winter Educators' Conference Proceedings. Chicago: American Marketing Association.

Kiecker, P., and C. L. Hartman (1994). Predicting buyers' selection of interpersonal sources: The role of strong and weak ties. In Chris T. A. and D. R. John (Eds.), Advances in Consumer Research. Provo, UT: Association for Consumer Research.

Kiesler, S., and L. Sproull (1992). Group decision making and communication technology. Organizational Behavior and Human Decision Processes, 52, 96-123.

Krauss, R. M., and Fussell, S. R. (1991a). Constructing shared communicative environment, Chapter 9 in perspectives on socially shared cognition, L. B. Resnick, J. M. Levine, and S. D. Teasley (eds.), American Psychological Association Press, Washington, DC, 1991a, pp. 172-200.

Kumar, N., and I. Benbasat (2006). The influence of recommendations and consumer reviews on evaluations of websites. Information Systems Research, 17 (4), 425-439.

Kurt, Didem, J. Inman, and J. J. Argo (2011). The influence of friends on consumer spending: The role of agency-communion orientation and self-monitoring. Journal of Marketing Research, 48 (4), 741-754.

Lamm, H., G, Trommsdorff. 1973. Group versus individual performance on tasks requiring ideational proficiency (brainstorming): A review. Eur. J .Soc. Psych.3 (4) 361-387.

Lee, J., D. Park, and I. Han (2008). The effect of negative online consumer reviews on product attitude: An information processing view. Electronic Commerce Research and Applications, 7, 341-352.

Li, X., and L. M. Hitt (2008). Self-selection and information role of online product reviews. Information Systems Research, 19 (4), 456-474.

Mangleburg, T. F., P. M. Doney, and T. Bristol (2004). Shopping with friends and teens' susceptibility to peer influence. Journal of Retailing, 80 (2), 101-116.

McGrath, J. E., and J. E. Kelly Jr. (1986). Time and human interaction: Toward a social psychology of time. New York: Guilford.

Mennecke, B. E., and J. S. Valacich (1998). Information is what you make of it: The influence of group history andcomputer support on information sharing, decision quality, and member perceptions. Journal of Management Information Systems, 15 (2), 173-197.

Moorthy, Sridhar, Brian T. Ratchford, Debabrata Talukdar. 1997. Consumer information search revisited: theory and empirical analysis. J. Consumer Res. 23 (March) 263–277

Mudambi, S. M., and D. Schuff (2010). What makes a helpful online review? A study of customer reviews on Amazon.com. MIS Quarterly, 34 (1), 185-200.

Murthy, U. S., and D. S. Kerr (2003). Deicision making performance of interacting groups: An experimental investigation of the effects of task type and communication mode. Information & Management (40), 351-360.

Nelson, K. M., and J. G. Cooprider (1996). The contribution of shard knowledge to IS group performance. MIS Quarterly, 20 (4), 409-432.

Neuwirth, C.M., D.S. Kaufer, R. Chandhok, and J.H. Morris (1990). Issues in the design of computer support for co-authoring and commenting. Proceedings of CSCW 1990, 183-195.

O'Hara, K. and M. Perry (2001). Shopping Anytime Anywhere. In Proceedings of Conference on Human Factors in Computing Systems (CHI 2001), 2001.

Olivera, F., P. S. Goodman, S. S. Tan (2008). Contribution behaviors in distributed environments. MIS Quarterly, 32 (1), 23-42.

Olson, G. M., and J. S. Olson (2000). Distance matters. Human Computer Interaction, 15(2), 139–178.

Osborn, A. F. (1957). Applied imagination: Principles and procedures of creative problem solving. New York: Charles Scribner's Sons.

Puglia, S., R. Carter, and R. Jain (2000). MultECommerce: A Distributed Architecture for Collaborative Shopping on the WWW. In Proceedings of the ACM Conference on Electronic Commerce (EC, 00), 2000.

Robert, L., and A. R. Dennis (2005). The paradox of richness: A cognitive model of media choice. IEEE Transactions on Professional Communication, 48 (1), 10-21.

Schmidt, J, B., and Spreng, R, A. (1993). A proposed model of external consumer information search. Journal of academy of marketing science, 24 (3), 246-256.

Schulz-Hardt, S., F. C. Brodbeck, A. Mojzisch, R. Kerschreiter, and D. Frey (2006). Group decision making in hidden profile situations: Dissent as a facilitator for decision quality. Journal of Personality and Social Psychology, 91 (6), 1080-1093.

Spreng, Richard A. and Richard W, Olshavsky. (1989). Exploring the headwaters of the prior knowledge-search relationship. In proceedings of the American marketing association summer educators'conference. 220-224.

Tan, C. H., H. H. Teo, and I. Benbasat (2010). Assessing screening and evaluation decision support systems: A resource-matching approach. Information Systems Research, 21 (2), 305-326.

Tauber, E. M. (1972). Why do people shop? Journal of Marketing, 36, 46-49.

Tee, K, S. Greenberg, and C. Gutwin (2009). Artifact awareness through screen sharing for distributed groups. International Journal of Human-Computer Studies, 67, 677-702.

Te'eni, D. (2001). Review: A cognitive-affective model of organizational communication for designing IT. MIS Quarterly, 25 (2), 251-312.

Wang, W., and I. Benbasat (2007). Recommendation agents for electronic commerce: Effects of explanation facilities on trusting beliefs. Journal of Management Information Systems, 23 (4), 217-246.

Wei, Y., D. W. Straub, and A. Poddar (2011). The power of many: An assessment of managing Internet group purchasing. Journal of Electronic Commerce Research, 12 (1), 19-43.

Weick, K. E., and D. K. Meader (1993). Sensemaking and group decision systems, in Group Support Systems: New Perpectives, L. M. Jessup and J. S. Valacich (eds). New York: Macmillan, 230-252.

West, G. P. (2007). Collective cognition: When entrepreneurial teams, not individuals, make decisions. Entrepreneurship Theory and Practice, Jan, 77-102.

Westbrook, R. A., W. C. Black (1985). A motivation-based shopper typology. Journal of Retailing, 61 (1), 78-103.

Xiao, B., and I. Benbasat (2007). E-Commerce product recommendation agents: Use, characteristics, and impact. MIS Quarterly, 31 (1), 137-209.

Zhu, L., I. Benbasat, and Z. Jiang (2006). Investigating the role of presence in collaborative online shopping. In Proceedings of 12th American Conference on Information Systems. Acapulco, Mexico.

Zhu, L., I. Benbasat, and Z. Jiang (2010). Let's shop online together: An empirical investigation of collaborative online shopping support. Information Systems Research, 21(4), 872-891.

Zhu, F., and X. Zhang (2010). Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. Journal of Marketing, 74, 133-148.

Appendix 1 Experiment Scenario and Task Instruction

A. Co-buyer

Information on Cremeadvisor.com

As a recently launched hotel booking website, Cremeadvisor.com aims to make travelling affordable and enjoyable for students and budget travelers by providing comprehensive information on economical hotels around the world. The hotel information consists of hotel descriptions and customer reviews.

Hotel descriptions include hotel reputation, public facilities, room amenities, and various services provided, through which people could get a general image of a hotel. Customer reviews, on the other hand, were written and posted by previous visitors to the hotels to share their experiences in and evaluations on the hotels.

About Bali Island - Island of Paradise

Bali is widely recognized as “the paradise on the earth”. The varied landscape of mountains, sandy beaches, and lush rice terraces, together provide a picturesque backdrop to Bali’s colorful, deeply spiritual, and unique tropic affair.

Bali does not only satisfy the demand of young back-packers but also fulfills the lust of the super-rich. With world-class surfing and diving, multitudinous cultural and archaeological attractions, as well as an enormous range of accommodations, Bali is becoming one of the world's most popular travelling destinations.

Main Task Instruction

Assume that you and your friend are planning a trip to Bali Island together for three days and two nights (i.e. *June 24-26*). You would like to book a hotel online for this trip. However, you and your friend are currently in different cities, so are not able to discuss hotel choices face to face. You have thus decided to log on to Cremeadvisor.com at the same time to search for a hotel in Bali together.

Since you two will stay in the same hotel, the final hotel choice should reflect both of your preferences. You are expected to conduct the hotel search process jointly and make equal contributions to your booking decision. In other words, neither of you should dominate the hotel search process.

Please note that:

- Cremeadvisor.com only provides information on standard hotel rooms.
- Both of you are expected to actively suggest candidate hotels of your own preference for discussion.
- You are expected to pick a hotel that can satisfy both of you.
- All the hotels on Cremeadvisor.com are located in popular areas and not far from the beach, so please assume that location is not a concern.

Once the two of you have made a joint decision on which hotel to book, please raise your hand and inform the experimental coordinator right away.

Rewards

You will be paid S$15 for participation.

In addition, 5% of all participant groups will win an extra $150 lucky draw bonus. The bonus can only be redeemed to compensate the accommodation expenditure in the hotel selected in the experiment. The bonus is strictly non-transferable. To redeem the bonus,

please bring required official documents, such as original itineraries or official receipts, to verify your accommodation in the selected hotel.

B. Main buyer

Information on Cremeadvisor.com

As a recently launched hotel booking website, Cremeadvisor.com aims to make travelling affordable and enjoyable for students and budget travelers by providing comprehensive information on economical hotels around the world. The hotel information consists of hotel descriptions and customer reviews.

Hotel descriptions include hotel reputation, public facilities, room amenities, and various services provided, through which people could get a general image of a hotel. Customer reviews, on the other hand, were written and posted by previous visitors to the hotels to share their experiences in and evaluations on the hotels.

About Bali Island - Island of Paradise

Bali is widely recognized as "the paradise on the earth". The varied landscape of mountains, sandy beaches, and lush rice terraces, together provide a picturesque backdrop to Bali's colorful, deeply spiritual, and unique tropic affair.

Bali does not only satisfy the demand of young back-packers but also fulfills the lust of the super-rich. With world-class surfing and diving, multitudinous cultural and archaeological attractions, as well as an enormous range of accommodations, Bali is becoming one of the world's most popular travelling destinations.

Main Task Instruction

Assume that you are planning to book a hotel for your upcoming trip to Bali Island this coming June (i.e. *June 24-26*, three days and two nights). You want to get a second opinion from one of your friends in order to make a more informed decision.

However, you and your friends are currently in different cities, so are not able to discuss hotel choices face to face. You have thus decided to log on to Cremeadvisor.com at the same time and to search for a hotel in Bali together. Since you are the only one that will stay in the hotel, priority is given to your preference in hotel booking. In other words, you are expected to actively lead the entire hotel search process rather than let your friend dominate the process.

Please note that:

- Cremeadvisor.com only provides information on standard hotel rooms.
- You (rather than your friend) are expected to suggest candidate hotels of your preference for discussion.
- All the hotels on Cremeadvisor.com are located in popular areas and not far from the beach, so please assume that location is not a concern.

Once you have made your decision on which hotel to book, please raise your hand and inform the experimental coordinator right away.

Rewards

You will be paid S$15 for participation.

In addition, 5% of all participant groups will win an extra $150 lucky draw bonus. The bonus can only be redeemed to compensate the accommodation expenditure in the hotel selected in the experiment. The bonus is strictly non-transferable. To redeem the bonus, please bring required official documents, such as original itineraries or official receipts, to verify your accommodation in the selected hotel.

C. Opinion giver

Information on Cremeadvisor.com

As a recently launched hotel booking website, Cremeadvisor.com aims to make travelling affordable and enjoyable for students and budget travelers by providing comprehensive information on economical hotels around the world. The hotel information consists of hotel descriptions and customer reviews.

Hotel descriptions include hotel reputation, public facilities, room amenities, and various services provided, through which people could get a general image of a hotel. Customer reviews, on the other hand, were written and posted by previous visitors to the hotels to share their experiences in and evaluations on the hotels.

About Bali Island - Island of Paradise

Bali is widely recognized as "the paradise on the earth". The varied landscape of mountains, sandy beaches, and lush rice terraces, together provide a picturesque backdrop to Bali's colorful, deeply spiritual, and unique tropic affair.

Bali does not only satisfy the demand of young back-packers but also fulfills the lust of the super-rich. With world-class surfing and diving, multitudinous cultural and archaeological attractions, as well as an enormous range of accommodations, Bali is becoming one of the world's most popular travelling destinations.

Main Task Instruction

Assume that your friend is planning to book a hotel for his/her trip to Bali Island this coming June (i.e. *June 24-26*, three days and two nights). He/she wants to get a second opinion from you in order to make a more informed decision.

However, you and your friend are currently in different cities, so are not able to discuss hotel choices face to face. You have thus decided to log on to Cremeadvisor.com at the same time to search for a hotel in Bali together. Please note that priority should be given to your friend's preference in hotel booking because he/she is the only person that will stay in the hotel. In other words, your job is to assist your friend in evaluating hotels of his/her choice rather than dominate the hotel search process and make a decision for him/her.

Please note that:

- Cremeadvisor.com only provides information on standard hotel rooms.
- You are expected to follow your friend's hotel search during the entire hotel booking process.
- All the hotels on Cremeadvisor.com are located in popular areas and not far from the beach, so please assume that location is not a concern.

Once your friend has made his/her decision on which hotel to book, please raise your hand and inform the experimental coordinator right away.

Rewards

You will be paid S$15 for participation.

In addition, 5% of all participant groups will win an extra $150 lucky draw bonus. The bonus can only be redeemed to compensate the accommodation expenditure in the hotel selected in the experiment. The bonus is strictly non-transferable. To redeem the bonus, please bring required official documents, such as original itineraries or official receipts, to verify your accommodation in the selected hotel.

Appendix 2 Survey Instrument

Perceived Information Search Scope

1. My partner and I performed a thorough search for hotels on this website before we made our final hotel choice.
2. Before making the final hotel choice, my partner and I scrutinized many potential hotels.
3. We compared and evaluated a large number of hotels on this website.
4. We scrutinized almost all the hotel alternatives that might be useful for our hotel booking on this website.

Perceived Decision Quality

1. I believe we have made the best choice of hotel on the website.
2. We would make the same choice if we had to book a hotel on this website again.
3. I believe that the hotel that we have selected is the most suitable for us on the website.
4. I think we have picked the right hotel on this website.

Perceived Uncoupling

1. Frequently, one of us could not figure out what the other person was referring to when we discussed hotel alternatives.
2. Frequently, one of us could not locate the hotel information that the other person was reading.
3. When my partner and I wanted to exchange ideas about the same hotel, we often could not refer to the same issue due to the poor navigation coordination.

Perceived Ease of Uncoupling Resolution

1. When we were searching for hotels on this website, it was easy for my partner and me to resolve conflicts arising from poor navigation coordination.
2. My partner and I could easily navigate to the same webpage if we had decided to do so.
3. When we encountered any coordination problem, we could easily manage to resume our previous navigation pace.