

The Effects of Navigation Support and Group Structure on Collaborative Online Shopping

Yihong Cheng¹, Yanzhen Yue¹, Zhenhui (Jack) Jiang^{1,2}, and Hyung Jin Kim¹

¹ Dept. of Information Systems, National University of Singapore, Singapore, 117418

² National University of Singapore (Suzhou) Research Institute, 377 Lin Quan Street,
Suzhou Industrial Park, Jiang Su, P.R. China
yihong.c.nus@gmail.com,
{Yanzhen, jiang, kimhj}@comp.nus.edu.sg

Abstract. As a new paradigm of e-commerce, collaborative online shopping fulfills online consumers' needs to shop with close ones in a social and collaborative environment. While previous e-commerce research and practice mainly focus on consumers' individual shopping behavior, a recent trend is for consumers to buy things together online. This study proposes two new types of navigation support and investigates how different types of navigation support influence consumers' collaborative online shopping experience. Specifically, their impacts on consumers' coordination performance and perceived usefulness are assessed by comparing two types of extant navigation support in a lab experiment. Meanwhile, the moderating role of the group structure of collaborative consumers is also assessed.

Keywords: Collaborative Online Shopping, Navigation Support, Group Structure, Ease of Uncoupling Resolution, Perceived Usefulness.

1 Introduction

While previous e-commerce research and practice mainly focus on consumers' individual shopping behavior, a recent trend is for consumers to buy things together online. In this study, we look at this emerging phenomenon, collaborative online shopping (COS), defined as the activity in which a consumer shops at an online store concurrently with one or more remotely-located shopping partners [20]. COS provides collaboration support for consumers to search and evaluate products together. On one hand, collaborative online shopping enables consumers to share and exchange their opinions about products; on the other hand, it fulfills online consumers' needs to shop with close ones in a social and collaborative environment.

In spite of the evident demand for consumer collaboration, COS is not well supported by current e-commerce platforms [1]. Most of the e-commerce websites are designed for solitary use. Collaborative online consumers have to use their web browsers independent of each other, leading to ineffective communication and discussion due to lack of contextual information about each other's focus [3,6]. To better

support consumers' collaborative product search and evaluation, we attempt to propose new designs to solve the problem.

Since a prominent feature of COS is to facilitate collaborative product search, it is important to design appropriate navigation mechanisms that helps collaborative consumers navigate to the same products of their interest to establish a common referential context for the collaborative product evaluation and discussion. Two types of navigation support were investigated in prior studies [20], namely separate navigation and shared navigation. While the former only allows each user to view and control his/her own separate browser, the latter enables both collaborative users to synchronize their browsing paces so that one can always know what the other person is looking at. Prior research has found that although shared navigation is in general better than separate navigation in terms of collaborative product search, shared navigation leads to unexpected uncoupling problems when the two collaborators do not well coordinate with one another.

To solve this problem, we propose two new types of navigation support: separate navigation with location cue and split screen navigation. In the separate navigation with location cue condition, each user is provided with a clickable visual location indicator, which displays his/her partner's real-time location information. The user can navigate to the web page that his/her partner is viewing by clicking on the location cue. Split screen navigation divides the browser into two separate screens, with one screen controlled by one user and the other screen instantly displaying the current web page his/her partner is viewing. These two navigation support designs are empirically evaluated against separate navigation and shared navigation in this study.

Another purpose of this study is to investigate the moderating role of the group structure of collaborative shoppers. It is commonly observed that consumers may shop with others in two forms of group structure: (1) 'co-buyers' structure [2], e.g., two individuals buy a birthday gift together for their common friend; and (2) 'buyer/advisor' structure [18,20], e.g., one individual buys a skirt for herself, and she invites her friend to offer advices on product selection. It has not yet been empirically investigated whether or not the group structure of collaborative shoppers affects the effectiveness of different types of navigation support, and if so, to what extent.

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

2 Literature Review and Theoretical Foundations

Collaborative online shopping could be considered as a kind of real-time distributed collaboration, in which physically distant shopping partners collaboratively search for product alternatives of interest at the same time. Hence, we discuss two theories on situational awareness and dual task interference to provide the theoretical foundations for the exploration of effects of navigation support and group structure on collaborative online shopping consumers' experience.

2.1 Situational Awareness Theory

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” [6]. Situation awareness includes more than attending to information, but also the integration of multiple pieces of relevant information to the person’s goal [7]. SA plays an important role in various collaborative activities to reduce effort and increase efficiency for the activities of collaboration [8].

With the help of SA, people are able to keep an updated understanding of other people’s interaction with their shared workspace, which in turn guides people’s ensuing behavior. In contrast, without situation awareness, the ease and naturalness of collaboration will be lost, making remote collaboration awkward and inefficient as compared to face-to-face work [8]. Prior studies suggest that collaborators must attain and maintain reciprocal awareness of shared activity to coordinate effectively [3].

2.2 Dual Task Interference Theory

Dual-task interference refers to the situation where people perform two or more activities concurrently [16]. As the main theoretical underpinning for dual-task interference, “bottleneck” model assumes that individuals have limited cognitive capacity. Cognitive capacity is scarce mental resource [14], thereby when individuals perform two tasks at the same time, competition for the same cognitive resource may occur, leading to less cognitive capacity for each task and impaired task performance.

Prior empirical studies in IS have suggested that in a GSS system, participants who experience dual-task interference process less information (poorer performance) than participants working on a single task [10]. Similarly, in the collaborative online shopping context, it is quite common for shopping partners to search for product information on their own while scrutinize other’s activities for discussion, implying a high possibility to experience dual-task interference.

In this study, the effects of the two new types of navigation support (i.e. separate navigation with location cue and split screen navigation) are assessed by comparing with the extant separate navigation and shared navigation.

3 Research Model and Hypotheses Development

Information search has been considered as an important stage for web-based consumer decision making [15]. In information search stage, consumers actively collect information to make potentially better purchase decisions [17], whereas insufficient information search may lead to detrimental decision performance [12,19]. In this study, perceived ease of uncoupling resolution (defined as the extent to which consumers perceive that resolving the uncoupling occurred during the collaborative shopping process would be free from effort) and perceived usefulness (refers to the extent to which a particular type of navigation support is expected to help

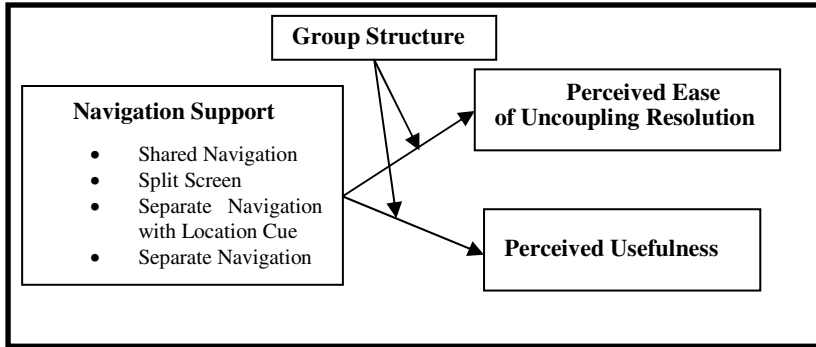


Fig. 1. Research Model

collaborative consumers to conduct product search together and accomplish their shopping goals) are included as dependent variables correspondingly to represent the two critical elements in the collaborative online shopping process.

The research model is proposed as shown in Figure 1.

3.1 Perceived Ease of Uncoupling Resolution

Uncoupling has been defined by Zhu et al. [20] as the state in which collaborative shoppers lose coordination with their shopping companions. According to situation awareness theory, situation awareness can reduce effort, increase efficiency and reduce errors for the activity of collaboration [8]. In the context of collaborative online shopping, the availability of awareness of shopping partners' current navigation state enables collaborative consumers to understand each other's contextual cues, and thus is likely to reduce coordination effort to resolve various uncoupling. Comparing with separate navigation, split screen and separate navigation with location cue provide more situation awareness via the shared screen and location cue. Accordingly, collaborative consumers would be aware of their partner's current focus of attention and ensure a shared referential base for discussion to facilitate the resolution of occurred uncoupling.

In shared navigation condition, shopping partners' web page navigations are always synchronized in the screen level. Collaborative shoppers are aware of each other's search path as well as the information that has been processed by their partner. When uncoupling occurs, collaborative shoppers may communicate with each other to pinpoint the location of the information on the current screen that both of them are looking at, or go back to a specific information based on the search path that they have experienced together, thus decreasing the effort to resolve uncoupling when compared to split screen and separate navigation with location cue. Therefore, we propose,

H1a: Compared to separate navigation, split screen and separate navigation with location cue leads to higher perceived ease of uncoupling resolution.

H1b: Compared to shared navigation, split screen and separate navigation with location cue leads to lower perceived ease of uncoupling resolution.

When using separate navigation with location cue, 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 as in split screen condition, which makes the pinpoint of the target information more difficult in separate navigation with location cue than in split screen. 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, or even the same information at the same time. Consequently, this misinterpretation may generate confusion and increase effort when they try to resolve the occurred uncoupling. Therefore, we propose

H1c: Compared to separate navigation with location cue, split screen navigation leads to higher perceived ease of uncoupling resolution.

3.2 Perceived Usefulness

Davis [5] suggested that the most important determinant of technology adoption is perceived usefulness. In the context of collaborative online shopping, perceived usefulness refers to the extent to which a particular type of navigation support is expected to help collaborative consumers to conduct product search together and accomplish their shopping goals.

One of the major facilitator for collaborative online shopping is to establish a common referential context for the product information sharing and discussion. Compared to separate navigation, separate navigation with location cue and split screen navigation enable collaborative consumers to be more aware of the contextual information regarding what product their partners are currently examining. By clicking on the location cue bar (with separate navigation with location cue) or switching their attention to the shared screen side (with split screen navigation), consumers could navigate to the target product page and access the same information shared by their partners without much effort. In other words, the accessibility of target information displayed on partners' screen is greatly enhanced with the help of location cue and split screen. While providing situational awareness to collaborative consumers, separate navigation with location cue and split screen also allow them to search for products in parallel, rather than tightly bounded in the same screen, as the case in shared navigation condition. As a result, this may encourage more efficient information search, and consequently render a higher perceived usefulness. Therefore, we propose

H2a: Compared to separate navigation, split screen and separate navigation with location cue leads to higher perceived usefulness.

H2b: Compared to shared navigation, split screen and separate navigation with location cue leads to higher perceived usefulness.

As split screen navigation provides more situation awareness than location cue, which alleviates the effort to explain to each other about which information being viewed, collaborative consumers will have more cognitive resource to search for and scrutinize new product information with split screen. Therefore, we propose:

H2c: Compared to separate navigation with location cue, split screen navigation leads to higher perceived usefulness.

3.3 Moderating Effects of Group Structure

The concept of group has been frequently studied in the context of computer-mediated collaboration as well as real time distributed collaboration [11, 18]. In this study, we apply the concept of group structure which is defined as an indication of the role combination among group members. Specifically, we identify two forms of group structures, namely, “co-buyers” and “main buyer/opinion giver”. In co-buyers structure, all group members are the direct beneficiaries of a product or products collaboratively purchased. In contrast, in main buyer/opinion giver structure, there is only one direct beneficiary (i.e. main buyer) of the product, with opinion giver providing suggestions to the products of interest by main buyer.

According to Pashler [16], dual task interference refers to the situation where people need to perform two or more activities concurrently. Prior research on dual task interference has indicated that dual task interference significantly reduces people’s information processing and decreases task performance [4].

Dual task interference is more likely to occur when shopping companions are formed in co-buyers structure. The reason is that, in co-buyers structure, both shopping partners are inclined to actively and collaboratively engage in product information search and evaluation process. While searching products of interest by themselves, they are also required to attend to the products information suggested by their partners. Thereby, they are forced to split their limited cognitive resources between different sub-tasks. The frequent switch between information processing task of the product of interest by themselves and information processing task of the product of interest by their partners makes the cognitive resources rather rare. Consequently, split screen is better than separate navigation with location cue in easing the effort to resolve the uncoupling when it occurs, and search more efficiently for product alternative information.

On the contrary, in the main buyer/opinion giver structure, both individuals focus on one single task, i.e. evaluating the product of interest only by the main buyer, resulting in much cognitive resources saved for both main buyer and opinion giver. Therefore, the use of split screen versus separate navigation with location cue is unlikely to cause significant differences in perception of ease of uncoupling resolution and perceived usefulness.

H3a: The superiority of split screen navigation over separate navigation with location cue in terms of perceived ease of uncoupling resolution will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyers structure.

H3b: The superiority of split screen navigation over separate navigation with location cue in terms of perceived usefulness will be less prominent when the group is formed in a main buyer/opinion giver structure as compared to a co-buyers structure.

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. Each person who volunteered was asked to invite a friend to attend the experiment together with him/her, to emulate a real shopping context. A total of 74 dyads were recruited from a major public university campus and randomly assigned to the eight treatment conditions.

The two subjects in the same dyad were allocated in two different rooms. They were asked to visit a website to book a hotel room collaboratively with the assigned navigation support, as if both of them (co-buyers structure) or only one of them (main buyer/opinion giver structure) need(s) to stay in for their/his coming overseas trip. After finishing the hotel searching and selection, the subjects completed questionnaires and were paid \$15 each as participation reward.

The questionnaires items (using 7-point Likert scale) were generated based on a review of the previous information systems and marketing literatures. Where previously tested measures were not available, we developed items based on the construct definition and description. Three faculty members and eight PhD students were invited to discuss the phrasing of the items to ensure that the items had at least content validity.

5 Data Analysis

5.1 Manipulation Check

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-buyers structure and main buyer/opinion giver structure is observed ($F = 91.5$, $p < .001$) 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 was successful.

5.2 Hypotheses Testing

Analyses of variances (ANOVA) were conducted in hypotheses testing. Corresponding results are shown in Tables 1-3.

Table 1. ANOVA Summary: Perceived Ease of Uncoupling Resolution

Source	d f	Mean square	F	Sig.
Navigation Support	3	.295	.384	.765
Group Structure	1	.008	.011	.917
Navigation Support * Group Structure	3	2.201	2.868	.043*

Table 2. ANOVA Summary: Perceived Usefulness

Source	d f	Mean square	F	Sig.
Navigation Support	3	4.019	4.189	.009*
Group Structure	1	.413	.431	.514
Navigation Support * Group Structure	3	.802	.836	.479

The results in Table 1 indicate that H1a, H1b, and H1c are not supported. H3a was further tested by only considering separate navigation with location cue and split screen. It shows the significant interaction effect exists ($F=4.489$, $Sig.=.041$), and thus H3a is supported (Figure 2).

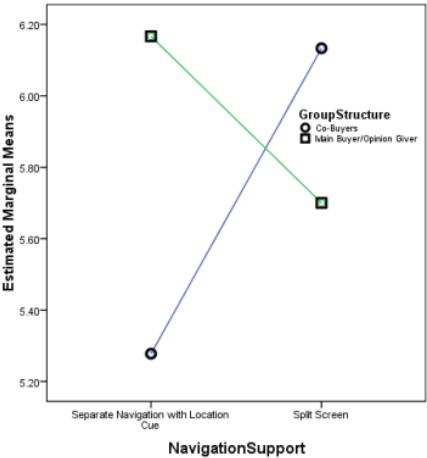


Fig. 2. Results on Perceived Ease of Uncoupling Resolution

Table 3. Tukey Multiple Comparisons of Perceived Usefulness

Group A	Group B	Mean difference (A-B)	Sig.
Separate Navigation	Separate Navigation with Location Cue	-0.801	0.067
	Split Screen	-0.787	0.083
	Shared Navigation	0.031	0.999
Separate Navigation with Location Cue	Separate Navigation	0.801	0.067
	Split Screen	0.013	0.999
	Shared Navigation	0.832	0.053
Split Screen	Separate Navigation	0.787	0.083
	Separate Navigation with Location Cue	-0.013	0.999
	Shared Navigation	0.818	0.066
Shared Navigation	Separate Navigation	-0.031	0.999
	Separate Navigation with Location Cue	-0.832	0.053
	Split Screen	-0.818	0.066

The results in Table 2 and Table 3 show that H2a and H2b are marginally supported, while H2c, and H3b are not supported.

6 Conclusions

This study proposes two new types of navigation support and examines their effects on consumers' perceived ease of uncoupling resolution and perceived usefulness. The findings show that 1) separate navigation with location cue and split screen leads to higher perceived usefulness than separate navigation and shared navigation; 2) there's significant interaction effect between navigation support and group structure, i.e. the superiority of split screen navigation over separate navigation with location cue in terms of perceived ease of uncoupling resolution will be less prominent when the group is formed in main buyer/opinion giver structure as compared to a co-buyers structure.

This study opens new directions for future research on collaborative online shopping. For example, this study only looks into a two-shopper situation which may limit its contribution to a relative small scope. In real life, it is natural that people tend to shop in groups of more people. Future study may consider collaborative shopping group with more than two people. In addition, there may be some other variables that could also moderate the effects of navigation support, such as trust between the collaborative shoppers, implying that different types of navigation support may have distinct effects in various situations.

Acknowledgement. The authors thank Singapore Ministry of Education for their financial support (Project number: MOE2009-T2-1-062).

References

1. Benbasat, I.: HCI Research: Future Challenges and Directions. *AIS Transactions on Human-Computer Interaction* 2(2), 16–21 (2010)
2. Bettman, J.R., Johnson, E.J., Payne, J.W.: Consumer Decision Making. In: Robertson, T.S., Kassirjian, H.H. (eds.) *Handbook of Consumer Behavior*. Prentice Hall, Englewood Cliffs (1991)
3. Carroll, J.M., Rosson, M.B., Farooq, U., Xiao, L.: Beyond being aware. *Information and Organization* 19, 162–185 (2009)
4. Chewing, E., Harrell, A.: The effect of information overload on decision makers' cue utilization levels and decision quality in financial distress decision task. *Accounting, Organizations and Society* 15(6), 527–542 (1990)
5. Davis, F.D.: Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13(3), 319–339 (1989)
6. Endsley, M.R.: Toward a Theory of Situation Awareness in Dynamic Systems. *Human Factors* 37(1), 32–64 (1995)
7. Endsley, M.R., Garland, D.J. (eds.): *Situation awareness analysis and measurement*. Lawrence Erlbaum Associates, Mahwah (2000)
8. Gutwin, C., Greenberg, S.: A descriptive framework of workspace awareness for real-time groupware. *Computer Supported Cooperative Work* 11, 411–446 (2002)
9. Helson, H.: *Adaptation-Level Theory*. Harper & Row, New York (1964)
10. Heninger, W.G., Dennis, A.R., Hilmer, K.M.: Individual Cognition and Dual-Task Interference in Group Support Systems. *Information Systems Research* 17(4), 415–424 (2006)
11. Katz, A., Te'eni, D.: The Contingent Impact of Contextualization on Computer-Mediated Collaboration. *Organization Science* 18(2), 261–279 (2007)
12. Keller, K.L., Staelin, R.: Effects of Quality and Quantity of Information on Decision Effectiveness 14(2), 200–213 (1987)
13. Mennecke, B.E., Valacich, J.S.: Information is what you make of it: The influence of group history and computer support on information sharing, decision quality, and member perceptions. *Journal of Management Information Systems* 15(2), 173–197 (1998)
14. Navon, D., Gopher, D.: On the Economy of the Human Processing System. *Psychological Review* 86, 254–284 (1979)
15. O'Keefe, R., McEachern, T.: Web-Based Consumer Decision Support Systems. *Communication of the ACM* 41, 71–78 (1998)
16. Pashler, H.: Dual-Task Interference in Simple Tasks: Data and Theory. *Psychological Bulletin* 116(2), 220–244 (1994)
17. Schmidt, J.B., Spreng, R.A.: A Proposed Model of External Consumer Information Search. *Journal of the Academy of Marketing Science* 24, 246–256 (1996)
18. Snizek, J.A., Buckley, T.: Cueing and Cognitive Conflict in Judge-Advisor Decision Making. *Organizational Behavior and Human Decision Processes* 62(2), 159–174 (1995)
19. Tan, C.H., Teo, H.H., Benbasat, I.: Assessing screening and evaluation decision support systems: A resource-matching approach. *Information Systems Research* 21(2), 305–326 (2010)
20. Zhu, L., Benbasat, I., Jiang, Z.: Let's shop online together: An empirical investigation of collaborative online shopping support. *Information Systems Research* 21(4), 872–891 (2010)