Virtual Agent Locus of Control: Cognitive Assistance for Older Consumers' Online Shopping

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Background and Purpose. Virtual agents have been shown to alleviate older consumers' social barriers to e-commerce participation through increasing their perceptions of social support and trust (Chattaraman et al., 2012) and enjoyment (Kwon et al., 2010). Besides the social assistance, virtual agents also have the potential to provide cognitive assistance to older consumers who tend to experience declines in cognitive abilities such as perceptual speed, working memory, and attention (Czaja et al., 2001). For example, virtual agents may reduce older consumers' information overload by presenting information based on their needs and providing navigational guidance to prevent them from getting lost in the complex web environment (Kim & Baylor, 2006). In doing so, virtual agent assistance may contribute toward enhancing perceived efficacy and reducing errors among older consumers.

Locus of control is a virtual agent design dimension which refers to the issue of balancing agent versus user control in the interaction (Erickson, 1997). An agent can be designed with a greater emphasis on the user control or the agent control. The former restricts the agent's role to supporting the user's cognitive abilities by responding to rather than directing the user's experience, whereas the latter expands the agent's role to actively direct the information to the user and perform the requisite task on behalf of the user (Kim & Baylor, 2006). Older consumers tend to lack training in e-commerce and require more guidance in completing Internet tasks, which entails that higher agent control may be more beneficial to them. The purpose of this study is to examine the following hypotheses: Older consumers perceive lower information overload when a virtual agent is used versus not used (H1) and when the virtual agent is designed with greater agent control than user control (H2). Further, reduced information overload increases perceived efficacy (H3) and reduces errors during older consumers' e-shopping tasks (H4), which then enhance their patronage intent for the e-commerce site (H5).

Methods. A laboratory experiment with three conditions (no agent vs. agent control vs. user control) was conducted with 206 older consumers (93 male, 113 female; aged 61-89 years old). Participants were randomly assigned to one of the conditions and completed a task of purchasing a pair of shoes on a mock e-commerce site. Participants in the no-agent condition completed the task on their own, whereas those in the agent- or user-control conditions completed the task with the assistance of a virtual agent, named Paul. In the agent-control condition, Paul identified what participants wanted to find through conversation and searched the product on behalf of them as well as directly led them to the necessary web pages to complete the transaction. On the other hand, in the user-control condition, Paul played a passive, informational role by verbally explaining to participants how to search for products and navigate around the pages, rather than directly performing the tasks. After the shopping task, participants filled out a questionnaire containing measures of information overload, efficacy, and patronage

Page 1 of 2

intent. In addition, task screens of 48 participants, randomly selected, were video-recorded for coding the variety of errors made during their tasks.

    Results. Older participants perceived significantly higher information overload in the two agent conditions ($M_{\text{agent control}} = 2.1$, $M_{\text{user control}} = 2.0$) than in the no-agent condition ($M_{\text{no agent}} = 1.6$; $F_{2, 201} = 3.90$, $p < .05$), contrary to H1. Further, no significant difference was found in information overload between the two agent conditions ($p < .284$), rejecting H2. Regression analyses revealed that lower information load led to higher perceived efficacy in using the e-commerce site ($\beta = -.76$, $p < .001$) and lesser variety of errors made during the shopping task ($\beta = .33$, $p < .05$), supporting H3 and H4, respectively. Finally, perceived efficacy positively influenced older consumers' patronage intent for the e-commerce site ($\beta = .38$, $p < .05$), although the variety of errors during the shopping task did not influence older consumers' patronage intent ($\beta = -.10$, $p = 95$). Thus, H5 was partially supported.

    Conclusions. Findings of this study reveal that information overload significantly influences older consumers' efficacy in using e-commerce sites and the variety of errors made in their e-shopping tasks. These findings indicate that to cater to older consumers, e-commerce sites must employ website design strategies that can minimize their information overload. However, this study fails to demonstrate the cognitive benefits of virtual agents in reducing information overload for older consumers or differential effects of varying locus of control design strategies for agent-user interactions. Rather, the two agent conditions in this study generated greater information overload than the no-agent condition. This result might be because participants used the text modality to communicate with the agent, which gave them the burden of typing what they had to say to the agent. An agent that understands the user's spoken communication based on a speech recognition technology may address this issue.

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