

Intelligent Agents: A Way to Engage Seniors in Health Informatics

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Abstract

E-pharmacies are an excellent form of health informatics to enhance health care management efficacy among seniors by offering access to reliable health information and medication management services. However, seniors' cognitive aging is often associated with difficulty in learning and retaining new system knowledge, deterring them from using e-pharmacies and leading to social and emotional challenges. To address these challenges, we developed an intelligent agent, or a virtual persona embedded in web interfaces. The agent acted as a virtual pharmacist, providing step-by-step verbal and visual guidance for various e-pharmacy tasks. In collaboration with a local pharmacy and three local senior-serving agencies in Alabama, we implemented this agent in an e-pharmacy interface and invited 24 male and 26 female seniors to experience it. Participants' ages ranged from 65 to 84. The results revealed that seniors perceived significantly higher ease of use with (vs. without) the virtual pharmacist's assistance ($p < .05$). This enhanced ease of use led to the seniors' increased self-efficacy using the e-pharmacy ($\beta = .81, p < .01$). Seniors also perceived higher social support when receiving virtual pharmacist assistance ($p < .01$), which in turn drove increased trust in the ability ($\beta = .79, p < .001$) and integrity ($\beta = .70, p < .001$) of the e-pharmacy in meeting their needs. The enhanced efficacy ($\beta = .28, p < .05$) and trust in ability ($\beta = .59, p < .001$) resulted in greater satisfaction with the e-pharmacy, which in turn facilitated the seniors' intention to use the e-pharmacy for future needs. This outreach and research program showed the potential of increasing seniors' engagement with health informatics through the use of intelligent agent technology. Further, the significant role of an intelligent agent may extend beyond the senior population and address the cognitive, social, and emotional obstacles to using health informatics among many other underserved user groups.



Need

- Seniors (aged 65+ years old) are the fastest growing segment of the aging population has an increasing need for health informatics due to rising health issues with age.
- E-pharmacies are web-based pharmacy services that can provide seniors with enhanced healthcare management, autonomy and efficacy among seniors by offering access to reliable health information and medication management services.
- Nevertheless, seniors show low ability to process and comprehend e-pharmacy information and procedures.

Virtual Pharmacists (VP): Intelligent Agent Technology

- The VP ("Jeff") was created using NOAH animated character technology offered by the National Center for Human-Computer Interaction and is designed to provide verbal and visual guidance to users for four e-pharmacy tasks:
 - e-pharmacy account sign up
 - prescription refill order
 - prescription refill reminder set up
 - search for drug information
- The VP provided:
 - verbal aids by offering step-by-step instructions through e-pharmacy procedures, and
 - non-verbal aids through (1) deictic agent behavior (movement across the screen and highlighting of specific content, which direct viewer attention.
- The VP was implemented on an e-pharmacy interface modeling after existing e-pharmacies (e.g., Bubbas.com, CVS.com) (see Fig. 1).

Engagement & Evaluation Design

Participants: 50 seniors (26 females, 65-84 years old, $M_{age} = 71.3$), recruited from members of Osher Lifelong Learning Institute (OLLI) at Auburn University and the Council of Governments-Area Agency on Aging.



Evaluation: Senior participants were divided into two groups, **the first group** used the e-pharmacy tasks, and **the second group** completed the e-pharmacy tasks with the VP. After completing the tasks, participants gave their responses to the paper-and-pencil questionnaire (see Table 1).

Outcomes

- Evaluation results revealed that with (vs. without) VP assistance, seniors perceived significantly higher ease of use, social support, self-efficacy, and trust in the ability and integrity of the e-pharmacy in use.
- Linear regression analyses (see Fig. 2) revealed that:
 - The enhanced perceived ease of use due to VP assistance significantly increased seniors' self-efficacy of using the e-pharmacy ($\beta = .81, p < .01$).
 - The enhanced perceived social support due to VP assistance significantly increased seniors' self-efficacy and integrity of the e-pharmacy in use ($\beta = .79, p < .001$).
 - The enhanced efficacy ($\beta = .28, p < .05$) and trust in the ability and integrity of the e-pharmacy, which in turn facilitated the seniors' intention to reuse the e-pharmacy for future needs ($\beta = .51, p < .01$).

Project Goals & Objectives

The goal of this project is to develop and evaluate an intelligent agent technological solution to enhance the usability of e-pharmacy services for seniors.

To meet this goal, we developed a Virtual Pharmacist (VP), an animated embodiment on an e-pharmacy interface that interacts with the user with the objectives of:

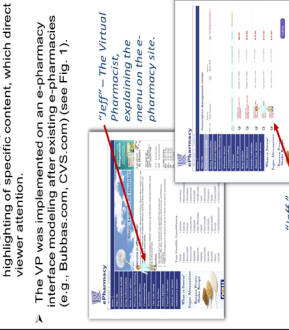
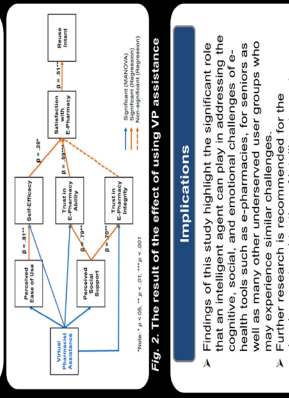


Table 1. The results of MANOVA

Measure	Scales Mean		Source
	With VP	Without VP	
Ease of Use	4.27	3.72	.027*
Social Support	4.00	3.23	.002**
Self-Efficacy	4.07	3.59	.037*
Trust in Ability	4.19	3.68	.044*
Trust in Integrity	3.92	3.47	.044*

*p < .05, **p < .01, ***p < .001



Implications

- Findings of this study highlight the significant role of intelligent agents in addressing the cognitive, social, and emotional challenges of health tools such as e-pharmacies, for seniors as well as many other underserved user groups who may experience similar challenges for the development and testing of intelligent agents as an advanced decision aid in complex e-health and other decision making contexts, beyond providing procedural aids on social tasks (emotional support).

Figure 1. A mock e-pharmacy interface

"Jeff" explaining the prescription refill process on the e-pharmacy interface

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