

## Chapter 59

# Instructional Design in Digital Environments and Availability of Mental Resources for the Aged Subpopulation

**Renae Low**

*The University of New South Wales, Australia*

**Putai Jin**

*The University of New South Wales, Australia*

**John Sweller**

*The University of New South Wales, Australia*

### **ABSTRACT**

*In this digital era, the gap between the elderly and younger generations in their use of computer-based technology is wide, and many researchers in behavioural and social sciences, along with educators, welfare workers, and policy makers, are concerned about this disturbing phenomenon. However, it is not clear whether this discrepancy is due to a lack of previous access to information technology or declining mental ability in the course of aging. The purpose of this chapter is to consider the aged subpopulation's needs and their ability to use digital technology from the perspectives of human cognitive architecture and the principles of instructional design guided by cognitive load theory. The authors focus on the following critical issues: a) the evolution and formation of human cognitive architecture, b) cognitive functioning as influenced by aging, c) compatibility between elderly people's available mental resources and the cognitive requirements of digital equipment, and d) guidelines for human-computer multimedia interactions derived from the accumulated experimental evidence on effective instructional design and delivery.*

DOI: 10.4018/978-1-4666-4422-9.ch059

## **INTRODUCTION**

Two significant phenomena, rapid population aging and proliferation of the Internet and other digital technologies, have coincidentally occurred during the recent two decades. This trend, according to researchers in multiple disciplines, such as gerontologists, psychologists, sociologists, and information technology experts, will continue and have a profound impact on society as a whole (e.g., Crimmins, Kim, Langa, & Weir, 2011; Eastman & Iyer, 2005; Henke, 1999; Oerlemans, Bakker, & Veenhoven, 2011; Kaye, et al., 2011; Opalinski, 2001; Payette, Gueye, Gaudreau, Morais, Shatenstein, & Gray-Donald, 2011; Reisenwitz, et al., 2007; Seeman, Miller-Martinez, Stein Merkin, Lachman, Tun, & Karlamangla, 2011; Zaphiris & Rifaht, 2006). The first phenomenon, rapid population aging, was initially evident in developed countries such as the United States, France, and Japan due to increased life expectancy and lowered birth rate; now even a proportion of developing countries such as China are faced with a number of challenging issues associated with their aging populations. Research in gerontology and psychology has in general indicated the importance for seniors to be engaged in social, physical, and cognitive activities to improve their quality of life. For instance, in a large-scale, two-year daily reconstruction study, seniors ranging from 55 to 88 years reported that their feeling of happiness increased when they combined effortful activities in social, physical, cognitive, and household-related aspects with restful routines; notably, this study was completed by seniors using a hyperlink highlighted in a received e-mail to fill in an electronic diary (Oerlemans, et al., 2011). Social policies and community programs have been developed and implemented to promote the elderly's general wellbeing and to accommodate their special needs. One of the significant changes in recent years due to the improvement of health services and raised living standards is that a growing proportion of seniors are relatively

independent, active, and eager to learn. Hence, life-long learning becomes a real, challenging issue on the agenda in education. Policy makers can no longer afford just to pay lip service to the issue and educators must find effective, efficient, and economical ways to deliver various useful programs to the elderly.

Not long after the Internet first came into popular use in 1994, there appeared accumulated anecdotal evidence about the potentiality of this new technology to be used by the elderly to overcome their social isolation and to facilitate their daily activities including self-organized learning. As pointed out by a number of researchers (e.g., Henke, 1999; Opalinski, 2001; Reisenwitz, Iyer, Kuhlmeier, & Eastman, 2007), the growth in the use of the Internet by the elderly in the following aspects can make their life easier and more colourful: trip-making, shopping, financial management, health education, government information, learning material, career reorientation, volunteer engagement, hobby development, pastime planning, social connection, political participation, and religious involvement. All those activities via the Internet can be helpful to overcome older adults' feelings of loneliness, boredom, helplessness, and a decline of mental skills that are known as the four plagues in elderly people's life, and may even be useful for them to re-define careers and/or re-set future life goals. However, despite the fact that seniors comprise a fast growing segment of Internet users, relative to other consumer groups, they are still much under-represented (Eastman & Iyer, 2005; Reisenwitz, Iyer, Kuhlmeier, & Eastman, 2007). Research indicates that seniors with higher levels of nostalgia proneness tend not to access the Internet frequently, have an inadequate online experience, with a proportion of seniors feeling uncomfortable using the Internet. Even elderly people who are willing to use the Internet as a source of general information use it less than young adults. To reduce this "digital divide" between information technologies and our population of older adults, it is vital to form appropriate

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