12-11-2016

When Modern IT Meets an Old Workforce: A Moderated Mediation Model of Age, Information Processing Resources, and Performance on Computerized Tasks

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Research Idea

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Abstract

Given that age is considered a key demographic variable for IS research, recent work has accumulated overwhelming evidence that older workers perform worse on computerized tasks than their younger counterparts. This finding is alarming given the facts that the workforce is rapidly growing older and, at the same time, organizational technologies are proliferating. However, the reasons for the finding that older workers perform worse on computerized tasks remain unclear, limiting managers' understanding of what can be done to assist older employees in realizing their full potential. The research presented here explores a pertinent reason why: the speed with which people process information. Based on the importance of information processing for IT-related work, we present a research model theorizing that older workers perform worse on computerized tasks than their younger counterparts due to differences in processing speed between older and younger individuals. The model, thus, aims to explain precisely how and why older workers demonstrate lower computerized task performance (i.e., mediation analysis). A related issue concerns the question of what can be done to help older workers remain productive members of the workforce despite declining processing speed. To examine this question, the model specifies computer experience and self-efficacy as potential buffers against the negative impacts of declining processing speed (i.e., moderated mediation analysis). Preliminary data lent initial support to the model. The research concludes that effective managerial interventions are needed to address the adverse effects of declining processing speed for IT-related work.

Keywords: Information systems, Information technology, Age, Older, Information Processing, Speed.

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Research Idea

Based on the fact that age is a "key demographic variable" for IS research (Venkatesh et al. 2003, p. 469), recent work has accumulated overwhelming evidence that older workers perform worse on computerized tasks than their younger counterparts (older workers are defined as workers 60 years of age and over; e.g., Reed et al. 2005; Graff 2005; Laberge and Scialfa 2005; Lindberg et al. 2006; Sharit et al. 2008; Wagner et al. 2010). This finding is alarming given the facts that the workforce is rapidly growing older and, at the same time, organizational technologies are proliferating. However, the reasons for the finding that older workers perform worse on computerized tasks remain unclear, limiting managers' understanding of what can be done to assist older employees in realizing their full potential. The research idea presented here explores a pertinent *reason why*: the speed with which people process information.

Processing speed is an important mechanism to explaining age-related impacts in IS research, for two main reasons (Tams et al. 2014). First, IT has dramatically increased the information processing demands in the workplace (Czaja and Sharit 1993; Gallivan et al. 2005); employees in IT-enabled work environments have to process vast amounts of information at a fast rate. These significant information processing demands linked to IT-related work can be explained with the increased work pace even for simple data entry tasks (Czaja and Sharit 1993) and with the complexity of the information that requires processing (e.g., manipulation and integration of data in Microsoft Excel or Access). As a result, computerized tasks are considered mentally demanding to a great extent (Birdi and Zapf 1997; Czaja and Sharit 1993). Overall, information processing lies at the heart of IT-related work (Gallivan et al. 2005).

At the same time, a major theory of aging holds that the speed of information processing declines with advanced age (Salthouse 2016a, 2016b, 2000; Salthouse & Madden 2013). Specifically, processing speed is relatively stable at middle age, but it begins to decline after people reach their late middle age. From that moment on, individuals' processing speed continues to decline. Research on the psychology and physiology of aging has accumulated a large body of evidence for the pattern of declining processing speed, and it has established processing speed as a primary mediator construct between age and various behavioral outcomes, such as performance (Habeck et al. 2015; Salthouse and Czaja 2002).

Based on the importance of information processing for IT-related work and the declining speed of information processing with age, we present a research model suggesting that older workers perform worse on computerized tasks than their younger counterparts due to differences in processing speed between older and younger individuals. The model, thus, aims to explain precisely how and why older workers perform less well on computerized tasks (i.e., mediation analysis).

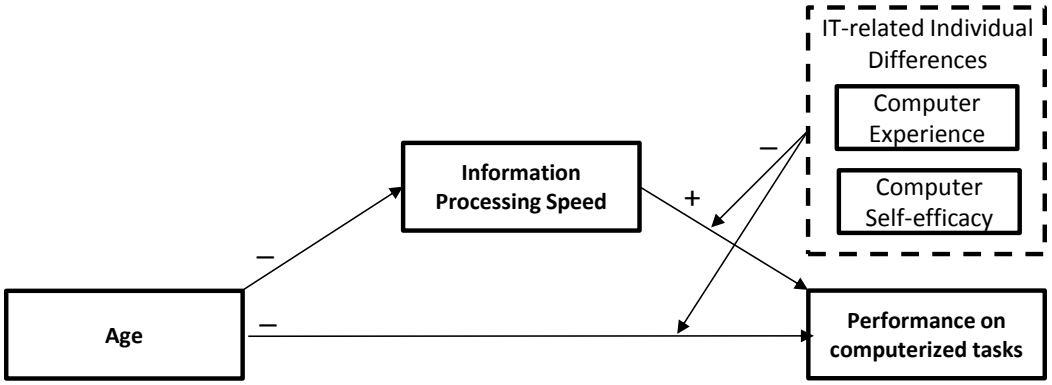
A related issue concerns the question of what can be done to help older workers remain productive members of the workforce despite declining processing speed. To examine this question, the model specifies computer experience and self-efficacy as potential buffers against the negative impacts of declining processing speed. Computer experience is relevant because experience with technologies can impact the degree to which they demand processing resources (Sweller 1994; Tomporowski 2003). The axiom *practice makes perfect* illustrates this idea, implying that as behaviors become more automatic due to increasing experience, they demand fewer processing resources. Consequently, at high levels of computer experience, the demands of computerized tasks for processing resources are relatively low (all else being equal) so that reduced processing speed should have less of an impact on peoples' performance. Further, computer self-efficacy is relevant here because, generally, domain-specific self-efficacy can alter the extent to which cognitive demands impact behavioral outcomes (Bandura 2012; 1994). People high in self-efficacy can better mobilize the cognitive resources necessary to complete a task. Hence, computer self-efficacy might alter the extent to which processing speed impacts performance on computerized tasks.

Overall, we advance the following hypotheses (see Figure 1 and Table 1):

H1: Information processing speed mediates the negative effect of age on performance, that is, there is a negative, indirect effect of age on performance via processing speed.

H2a: The strength of the mediated relationship between age and performance (via processing speed) depends on computer experience; the negative, indirect effect of age via processing speed on performance will be weaker for more experienced users.

H2b: The strength of the mediated relationship between age and performance (via processing speed) depends on computer self-efficacy; the negative, indirect effect of age via processing speed on performance will be weaker for users with higher levels of computer self-efficacy.



The model denotes our mediation hypotheses: simple mediation in the case of H1 and 2nd stage moderated mediation in the cases of H2a and H2b (i.e., the indirect effect of age on performance via processing speed is moderated by IT related individual differences, especially computer experience and computer self-efficacy). In other words, the *b* path is moderated by IT-related individual differences.

Figure 1. Research Model

Construct	***Definition***
Age	Chronologically older compared to younger individuals (Salthouse & Czaja, 2000)
Information Processing Speed	Extent to which an individual can process, transform, convert, or alter information quickly in her head (Salthouse & Czaja, 2000)
Performance on computerized tasks	Extent to which an individual's task output is effective in meeting task objectives (Burton-Jones & Straub, 2006)
Computer experience	Extent to which an individual has been using computers over her lifetime (Harrison & Rainer, 1992; Taylor & Todd, 1995)
Computer self-efficacy	Extent to which an individual believes in her ability to sucessfully use a computer in support of work tasks (Compeau & Higgins, 1995)

Table 1. Construct Definitions

The model will be tested using a combination of survey and experimental methods. Data from a pilot test (n = 110) offered some initial support for the model, showing that the correlations were generally in the expected directions. The research idea presented here seeks to answer recent calls for examining age-related impacts on IS variables in greater detail (Tams et al. 2014), and it will contribute to IS research by showing how, why, and under what conditions older workers are at a disadvantage in using IT effectively. The question of *how and why* is explained by differences in processing speed between older and younger users, while the issue of *under what conditions* is addressed by varying levels of computer experience and self-efficacy. Ultimately, effective managerial interventions and policies are needed to address the adverse effects of declining processing speed (Picchio 2015). Computer training, e.g., could simultaneously increase computer experience (Tomporowski 2003) and self-efficacy (Marakas et al. 1998).

Acknowledgements

This research was supported by the Social Sciences and Humanities Research Council of Canada.

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