

Trust in Cognitive Assistants: A Theoretical Framework

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ABSTRACT

The main purpose of this research is to develop a framework of trust determinants in the interactions between people and cognitive assistants (CAs). CAs are defined as new decision tools that can provide people with high quality recommendations and help them make data-driven decisions to understand the environment around them. Trust is defined as the belief of people that CAs will help them reach a desired decision. An extensive review on trust in psychology, sociology, economics and policy making, organizational science, automation, and robotics was conducted to determine the factors that influence people's trust in CAs. On the basis of this review, a framework of trust determinants in people's interactions with CAs was developed where reliability, attractiveness, and emotional attachments positively influence people's trust in CAs. The framework also shows that relative advantages of innovativeness positively affect the intention to use CAs. Future research directions are suggested for developing and validating more concrete scales in measuring trust determinants in the interactions between people and CAs.

KEYWORDS

Cognitive Assistants (CAs), People's Interaction With CAs, Trust Determinants, Trust in CAs

INTRODUCTION

Today, Apple's Siri, Google's Now, Amazon's Echo, IBM's Watson, and other cognitive tools are beginning to reach a level of utility that provides a foundation for a new generation of cognitive collaborators and cognitive assistants (CAs) (Siddike & Kohda, 2018a; 2018b; 2018c; Siddike, Spohrer, Demirkhan, and Kohda, Siddike, Spohrer, Demirkhan, & Kohda, 2018a; 2018b; Spohrer & Banavar, 2015). CAs are new decision tools that can augment human capabilities and expertise in understanding the environment around us with depth and clarity (Siddike, Iwano, Hidaka, Kohda, & Spohrer, 2017; Spohrer, 2016; Spohrer, Bassano, Piciocchi, & Siddike, 2017; Spohrer, Siddike, & Kohda, 2017). CAs can provide people with high-quality recommendations and help them make better data-driven decisions (Demirkan et al., 2015). Trust is an important and essential issue to consider for CAs to be adopted by society. The progression from cognitive tool to assistant to collaborator to coach to mediator is in fact a progression of trust (Siddike et al., 2018a; 2018b).

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In the 19th century, people did not trust steam engines and “boilers.” The problem was that they often exploded. Over time, design and engineering improved, trust went up, and economic growth resulted (Siddike & Kohda, 2018c). For example, consider this one application of the steam engine in America (Arthur, 2011); in 1850, a decade before the Civil War, the United States’ economy was small—it was not much bigger than Italy’s. Forty years later, it was the largest economy in the world. What happened in between was the railroads (Arthur, 2011). In the 21st century, people do not fully trust CAs. Knowledge, technology, and organizations are three ways people augment themselves to become smarter (Norman, 1993). However, knowledge, technology, and organizations must be trusted to spur economic growth. Advanced cognitive systems must become trusted social entities to be effective in our culture (Forbus, 2016). Only as trusted social entities can cognitive systems augment human intellect and interact with people to co-create new knowledge, technology, and organizations (Siddike et al., 2018a; 2018b).

Researchers in the fields of sociology and psychology, organizational science, economics, automation, and robotics have focused on trust (Costa, Heras, Palanca, Novais, & Julián, 2016; Friemel, Morana, Pfeiffer, & Maedche, 2017; Garcia, 2016; Hancock et al., 2011; Hoff & Bashir, 2015; Mayer, Davis, & Schoorman, 1995; McGuinness, Glass, Wolverton, & da Silva, 2007; Muir, 1994; Muir & Moray, 1996; Lankton, McKnight, & Thatcher, 2014; Ostrom, 2003; Ostrom & Walker, 2003; Rempel, Holmes, & Zanna, 1985; Schoorman, Mayer, & Davis, 2007; Yuksel, Collison, & Czerwinski, 2017). In psychology and sociology, researchers focused on interpersonal trust in close relationships (Rempel, Holmes, & Zanna, 1985). Researchers from organizational science focused on organizational trust (Mayer, Davis, & Schoorman, 1995; Schoorman, Mayer, & Davis, 2007). In addition, researchers from economics focused on trust in information and trust in action for governing common resources (Henry & Dietz, 2011; Ostrom, 2003; Ostrom & Walker, 2003). Furthermore, researchers from automation discussed the trust of people in reliance on automation (Mayer, Davis, & Schoorman, 1995; McGuinness, Glass, Wolverton, & da Silva, 2007; Muir, 1994; Muir & Moray, 1996). Researchers from IS showed that technology trusting expectations influence trusting intention through performance, disconfirmation, and satisfaction (Lankton, McKnight, & Thatcher, 2014). In robotics, trust is described in terms of the attractiveness of robots and the emotional feelings people have toward them (Hancock et al., 2011; Yuksel, Collison, & Czerwinski, 2017). Furthermore, Alaiერი and Vellino (2016) described ethical robots that can make ethical decisions in a way that gives them some degree of responsibility.

In the case of personal assistants or CAs, Nunes, Barbosa, and de Lucena (2010) theoretically described a domain-neutral user meta-model that enables high-level user models to be used with configurations and preferences that increase users’ trust in personal assistant software. In the same way, McGuinness, Wolverton, and da Silva (2007) explained that transparency (verification) and provenance (source of information) are the main factors in trusting CAs. But, no researcher has yet discussed how much people trust their CAs in daily life. Therefore, the above research background clearly demands research in the area of trust in CAs.

RESEARCH PURPOSE AND DESIGN

The main purpose of this paper is to conceptually develop a framework of trust determinants in people’s interactions with CAs. More specifically, the objective is to review literature on trust from psychology and sociology, organizational science, economics, automation, and robotics to conceptualize trust in CAs. The second objective is to conceptualize the trust determinants in people’s interactions with CAs. The third objective is to propose a framework of trust determinants in the interactions between people and CAs. The final objective is to suggest future research directions to develop scales for the proposed framework of trust determinants in people’s interactions with CAs.

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