

# **The Effects of Disorientation and Cognitive Absorption on Adoption of In-Depth Recommendation Agents: The Moderating Role of Age and Gender**

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## **Abstract**

Recommendation Agents (RAs) are increasingly being made available to consumers to facilitate their online shopping decision making. However, in the information systems (IS) literature, there is a lack of understanding about the appropriate design of RAs to suit both younger and older adults, as well as both males and females. Grounded in the aging, valence theories, and information systems adoption literature, this experimental study investigates the effects of disorientation and cognitive absorption on adoption of in-depth online RAs and explores the moderating role of gender and age on these associations.

## **Keywords**

Recommendation agents, perceived disorientation, perceived cognitive absorption, age, gender

## **Introduction**

Properly designed Recommendation Agents (RAs), which defined as software tools that support online consumers by eliciting their preferences in products and consequently making appropriate recommendations for them (Xiao and Benbasat 2007), is considered as a critical success factor for online vendors who are confronted with increasingly competitive pressures (Xu et al. 2014). However, a poorly designed RA could result in frustrated consumers (Gretzel and Fesenmaier 2006) who may look for alternative channels to satisfy their needs (e.g., shopping offline) (Gourville and Soman 2005). This could be especially the case for older adults as they have limitations in their cognitive and physical abilities associated with the natural aging process (Ghasemaghaei 2016) and may, thus perceive higher disorientation (i.e. tendency to lose one's sense of location) (Webster and Ahuja 2006) and lower cognitive absorption (i.e. a state of deep involvement with software) (Agarwal and Karahanna 2000) while using RAs that provide large amount of details (i.e. high in-depth RAs). In addition, as women often pursue a more elaborative, detailed processing style (Meyers-Levy and Maheswaran 1991), compared to men, although they may perceive higher cognitive absorption, they may perceive higher disorientation while using high in-depth RAs. In the information systems (IS) literature, although gender and age could be as substantive variables in designing online RAs, no studies have examined the role of such factors on users' cognitive absorption and disorientation perceptions while using RAs that provide different levels of details in their input and output stages.

According to Agarwal and Karahanna (2000), cognitive absorption, an intrinsic motivation related variable, is critical in the study of technology use behavior because it serves as a key antecedent of using the technology. In addition, Webster and Ahuja (2006) argue that if users perceive disorientation while using a new technology, this will result in loss of interest, and frustration in using the technology. Hence, in this study, perceived cognitive absorption and perceived disorientation are considered as critical antecedents of using RAs in online shopping environment. As men are often favor a more undifferentiated, holistic manner of information processing compared to women (Meyers-Levy and Maheswaran 1991), we also investigate if there are any differences between women and men regarding

disorientation and cognitive absorption perceptions while using RAs with different levels of details. Moreover, as the older adult population is rapidly increasing, and as they have a strong interest in making purchases through the online environment (Lian and Yen 2014), in this study, we explore how individuals' age impacts their perceived disorientation and absorption while using online RAs with different levels of details. In the IS literature, age has been usually measured as the number of years from birth (i.e. chronological age) without much attention to individuals' self-perceptions about their age (Ghasemaghahi 2016; Hong et al. 2013). However, Sherman, Schiffman, & Mathur (2001) argue that "[A]ge is revealing itself to be more a state of mind than a physical state (p. 188)." Hong et al. (2013) found that the self-perception of individuals' own age (i.e. cognitive age) to be a better predictor of their behaviors and perceptions towards using technology than their chronological age. Hence, in this study, we utilize the cognitive age of users rather than their chronological age.

In this study, we leverage Aging, Valence theories, and information systems adoption literature, and will collect empirical data via an experiment to understand the effects of disorientation and cognitive absorption on adoption of in-depth online RAs and explore the moderating role of gender and age on these associations.

## **Theoretical Background**

### ***In-Depth RAs***

In this study, we define in-depth RA as the number of required product attributes elicited in the input stage, and the number of recommendations and associated product attributes in the output stage. While high in-depth RAs elicit large amounts of information about product attribute preferences in the input stage and produce several recommendations and associated product attributes in the output stage, low in-depth RAs ask consumers about only a few number of product attributes in the input stage and suggest only a few recommended products and associated attributes for customers to compare in the output stage.

### ***Aging***

There are three popular aging theories: the Inhibition, Resources, and Speed Theories (Cabeza 2002). Inhibition theory argues that age related deficits in cognitive performance may arise from a decreased efficiency in the ability to inhibit irrelevant information when focusing on the current task demands (Hartman and Hasher, 1991). According to resources theory, compared to the younger adults, older adults have limited amount of cognitive resources available for allocation to a given cognitive task (Kahneman 1973). Finally, speed theory indicates that aging is associated with a decline in the speed with which information processing can be performed (Cerella 1985).

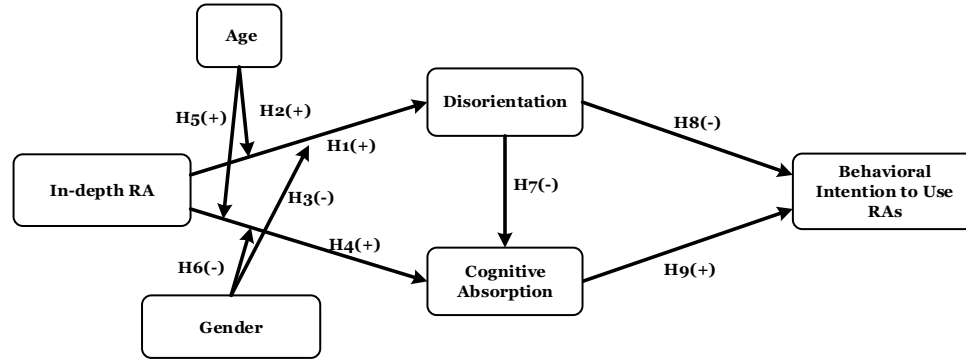
In the IS literature, chronological age which refers to the number of years since birth is often used to measure individuals' age. However, it is no longer considered a good predictor of factors such as cognitive ability and mental outlook (Ghasemaghahi et al. 2014). On the other hand, cognitive age, which refers to how old individuals are based on their self-perceptions regarding their looks, feelings, actions, and interests has been found to be a good predictor of consumers' behaviors (Guiot 2001). Hence, in this study, we utilize the cognitive age of users rather than their chronological age.

### ***Valence Theory***

According to valence theory, perceived benefit and risk are two essential aspects of consumer decision-making behavior. In the perceived benefit perspective, consumers try to maximize the positive utility of making a decision, while in the perceived risk perspective, consumers try to minimize any negative utility related to making a decision. As such, consumers' behavior encompasses both positive and negative aspects and thus, they often make decisions in accordance to maximizing their net valence (i.e., the difference between the positive and negative utilities) (Zeithaml, 1988). Hence, in this study, we argue that, compared to an RA with lower levels of details, an RA that provides more details in both input and output stages of the RA operation has the advantage of increasing users' cognitive absorption perception and the disadvantage of increasing users' disorientation perception in using such RA, which would eventually impact users' intention to use that RA in their online shopping experience.

## Research Model and Hypotheses

To answer the research objectives, we propose the research model shown in Figure 1 below. Behavioral intention to use a particular system is critical in the acceptance and use of new technology (Venkatesh et al. 2003), and hence, this construct is selected as the endogenous variable for this study.



**Figure 1. Research Model**

**Disorientation** refers to the tendency to lose one's sense of location and direction (Head et al. 2000). It occurs when the user does not have a clear conception of relationships within the system, and finds it difficult to decide where to look next within the system (Woods 1984). In the context of this study, we argue that compared to the low in-depth RAs, as high in-depth RAs provide users more information, they may perceive higher disorientation while using such RAs. Based on the valence theory, perceived disorientation could be considered as a risk of using high in-depth RAs in online shopping experience. Compared to younger adults, older adults are likely to have higher disorientation perceptions when they use high in-depth RAs, as according to aging theories, they face limitations in their physical and cognitive abilities (Kooij et al., 2008). Moreover, men often favor a more undifferentiated, holistic manner of processing while women often pursue a more elaborative, detailed processing style (Meyers-Levy and Maheswaran 1991). Thus, we hypothesize that **H1**: *In-depth RAs will have a positive impact on perceived disorientation*; **H2**: *Cognitive age moderates the effect of in-depth RAs on perceived disorientation, such that the effect is stronger for cognitively older adults*; and **H3**: *Gender moderates the effect of in-depth RAs on perceived disorientation, such that the effect is stronger for women*.

**Cognitive Absorption** refers to a state of deep involvement with a system (Agarwal and Karahanna 2000). Theory of flow (Csikszentmihalyi 1990) states that when people are so involved in an activity nothing else seems to matter. In the context of this study, we argue that users may perceive cognitive absorption when they use RAs that provide large amount of details. This is due to the fact that such RAs engage users highly in terms of answering to the large amounts of information about product attributes in the input stage and comparing several recommendations and associated product attributes in the output stage. Based on the valence theory, perceived cognitive absorption could be considered as a benefit of using high in-depth RAs in online shopping experience. Users may highly engage and appreciate using RAs which provides in-depth information because they don't need to search for it themselves and to have to subsequently file and retain the information until they make a decision. This could be particularly true in the case for older adults given their lower versatility in leveraging online resources to search for services and products that match their preferences on their own (Eastman and Iyer 2004). Furthermore, as women are often more detail-oriented than men (Meyers-Levy and Maheswaran 1991), they engage more in using online RAs and thus, compared to men, they may perceive higher cognitive absorption when they use RAs that provide in-depth information. Thus, we hypothesize that **H4**: *In-depth RAs will have a positive impact on perceived absorption*; **H5**: *Cognitive age moderates the effect of in-depth RAs on perceived absorption, such that the effect is stronger for cognitively older adults*; and **H6**: *Gender moderates the effect of in-depth RAs on perceived absorption, such that the effect is stronger for women*.

According to Webster and Ahuja (2006) users who feel lost in their online shopping experience may experience less attention while searching within a website. Disoriented users who feel lost and are unable to find the information they want cannot become absorbed in what they are doing (Spool et al. 1999). In

the context of this study, if users perceive disoriented while using an RA, they may not be able to deeply involve in using such RA. Thus, we hypothesize that **H7**: *Higher perceived disorientation results in lower perceived absorption while using an RA.*

McDonald and Stevenson (1998) argue that users will lose interest in using a system when they experience disorientation. This could be due to the fact that they become frustrated and cannot accomplish their goals (Bessiere et al. 2004). Webster and Ahuja (2006) also found that more disoriented users will have less intention to use a system in the future. Thus, we hypothesize that **H8**: *Higher perceived disorientation results in lower intentions to use the RA in the future.*

In the context of online shopping, Shang et al. (2005) argue that users that experience higher levels of cognitive absorption while using a website, will be more likely to have intention to use that website again in their online shopping experience. Likewise, Hsu and Lu (2004) found that when users deeply involve with a website, they have more interest in using that website. Thus, we hypothesize that **H9**: *Higher perceived absorption results in higher intentions to use the RA in the future.*

## Methodology

In the experimental design, participants with a wide range of ages will be asked to buy a car online while being supported with a high or low in-depth RA. A car is selected as the product for this study because it requires strong consumer involvement in the purchasing process, and it is a product of interest for both young and old adults (Lambert-Pandraud et al. 2005), as well as both men and women (Krahé and Fenske 2002). All the constructs in the research model are reflective. For reflective constructs, construct validity (i.e., discriminant and convergent validity) and construct reliability will be calculated (Werts et al. 1974). The main research objectives will be answered through validating the model of Figure 1 through structural equation modeling techniques using Partial Least Squares (PLS) as it is more suited for exploratory research (as the proposed study) (Gefen et al. 2000). The goodness of model fit will also be evaluated (Vinzi et al. 2010). ANOVA analysis will be conducted to compare the perceptions of adults of younger ( $20 \leq$  cognitive age  $\leq 30$ ) and older (cognitive age  $\geq 60$ ) cognitive age, as well as the perceptions of males and females while using low or high in-depth RAs. Hence, eight groups will be created following a  $2 \times 2 \times 2$  factorial design (Box et al. 1978). According to power analysis for mixed design, 30 subjects for each of the 8 between-subject factor groups will assure a sufficient statistical power of 0.8 for medium effect size ( $f = .25$ ) (Cohen 1988). Thus, a total of 240 subjects will be needed for this study. To account for possible spoiled surveys, a total of 270 participants will be recruited.

## Conclusion

This research promises to make significant contributions to both theory and practice. It will leverage and integrate the aging, valence theories, and information systems adoption literature to examine how the in-depth RA design influence consumers' intention to use RAs for online shopping which could be vary for males and females, as well as older and younger adults. In this study, as opposed to most IS studies, individuals' cognitive age will be used rather than simply using their chronological age to understand their intentions to use online RAs. For practitioners, the results of this study help them to understand if the in-depth design of online RAs affect consumers' online shopping experience based on their gender and age. Based on the results of this study, they can design online RAs with different levels of details to suit both males and females as well as both younger and older adults.

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