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How old are you really? Cognitive age in technology acceptance

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ABSTRACT

With increasing trends toward global aging and accompanying tendencies of (older) individuals to feel younger than they actually are, an important research question to ask is whether factors influencing IT acceptance are the same across individuals who perceive themselves to be as old as they actually are (i.e., cognitive age = chronological age) and those that perceive themselves to be younger than they actually are (i.e., cognitive age < chronological age). We conduct an empirical analysis comparing these two groups in the context of mobile data services (MDS). Our results show that for the "young at heart," perceived usefulness, perceived ease of use and perceived enjoyment play significant roles in their IT acceptance decisions, whereas for those who perceive themselves to be as old as they actually are, perceived ease of use and subjective norms were significant. Practical implications regarding use of cognitive age as a basis for customer segmentation in IT industries as well as theoretical implications about meaningful age in human computer interaction research are offered and discussed.

1. Introduction

Age differences have been known to play an important role in understanding human perceptions and behavior in various research domains including psychology [43,49], organizational behavior [e.g.,22,55], and marketing [e.g.,14,64]. The role of age is equally or more important for information systems (IS) research since the actual behavior [40] as well as attitude [16] with regard to technology adoption is critically linked to a user's age. Also, due to the fast-paced development and introduction of new technologies, different age generations are inevitably confronted with different generations of technologies. For example, most adolescents today grew up with the graphical user interface (GUI) and have never used command line interfaces (CLI); e-mail is the communication medium of choice for today's managers whereas those newly entering the workforce prefer to interact with one another via interactive social media such as Facebook or Twitter [38]. As computer pioneer Alan Kay so aptly put it, "[T]echnology is anything that was invented after you were born." Hence, attitudes toward technology may vary largely depending on one's age.

However, despite its significance in technology adoption and use, age has received little attention in IS research [59]. In the IS literature, age has typically been treated as a demographic control variable and measured as the number of years from birth (i.e., chronological age) without much consideration regarding the functional meaning of age in the individuals' minds. Chronological age measures the actual number of years that a person has lived and therefore does not reflect the idiosyncratic meaning of this number to different individuals. For example, age 40 may be perceived as old by some but young by others depending on their life satisfaction, activity level, health and culture [13]. Nonetheless, chronological age provides an objective measure of life length of each individual and has been widely used in the IS literature. For example, in testing the invariance of the factors driving technology adoption across different age groups Lai and Li [33] divided the subjects into young and old based on chronological age. Such routine and mechanistic operationalization of age may be problematic as the population ages and information technologies become more pervasive and an integral part of many everyday products and services [63], with the separation between work and personal use of such systems becoming blurred [28]. Mobile technologies such as smartphones in particular, serve as both personal consumer information appliance, as well as work platform. In short, discretionary adoption decisions regarding mobile technologies for personal use may also impact work performance. This casts the IT adoption decision as increasingly one of consumer choice, where the variance in age perception within the same demographic age group has received increasing attention. Research in psychology and marketing has questioned the appropriateness of using simple chronological measures of age for making inferences or predictions about attitudes or behaviors [e.g., 4,44,50,51]. As Schiffman and Sherman [50, p. 188] state, "[A]ge is revealing itself to be more a state of mind than a physical state." Indeed, it is self-perception of one's own age rather than chronological age that influences one's values and

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behaviors, as well as attitudes towards technology. For example, in a study of American elderly consumers, seniors who perceived themselves to be younger than their chronological age reported heavier use of the Internet than those whose self-perceived age was older [18]. The inadequacy of using chronological age stems from the fact that individuals' perceptions, attitudes and behaviors are influenced to a greater extent by how old a person feels (i.e., cognitive age) than by how long she has lived (i.e., chronological age) and that people often perceive themselves to be at an age different from their chronological age [4].

While other disciplines such as psychology, marketing, and organizational behavior have begun to employ self-perceived age as the measurement of choice [e.g., 52,54], IS research has used age measures based solely on birth-date (i.e., chronological age) [e.g., 10]. The frequent and unchallenged use of chronological age in IS research is understandable as it exhibits several characteristics that make it an attractive research measure. Chronological age is quantitative, unambiguous, can often be coded in continuous form and is relatively easy to acquire and validate. However, despite these desirable characteristics, the use of chronological age may limit our understanding of the role of users' age in technology acceptance and use – either as a focal attribute of interest determining technology adoption attitudes and perceptions or as a control or moderator variable that affects other variable relationships [e.g., 11,28–30,35,40,41,59,65]. Chronological age may be especially limiting as there may be an increasingly wide range of variation in perception of age amongst people in the same chronological age group. The variance of age perception is reported to be even more pronounced within the elderly age group. The baby boomers (born between 1946 and 1964) in the U.S. in particular have been found to be more active and in touch with advances in technology than would be dictated by general predictions based on their chronological age [17,48].

Our research addresses the question of whether and how self-perceived age affects technology adoption and usage behavior: does self-perceived age reveal heterogeneity among chronologically homogenous user groups? In other words, how do differences in self-perceived age of same-aged individuals influence user perceptions and behavior? What aspects of users' technology adoption/acceptance behavior would be affected? Such questions are particularly important with the increasing use of IT-enabled products and services in the mass market such as mobile data services, hand-held computational devices, smartphones, and game consoles that target end users exhibiting greater age variance relative to information systems users within organizational settings. If there are significant differences among same-aged users of varying cognitive age, conventional user segmentation approaches based solely on chronological age may produce limited (and perhaps misleading) insight into users' needs and factors affecting technology adoption.

The main objective of this paper is to critically revisit the use of age in technology adoption research. This paper investigates whether the theoretical relationships in models of technology acceptance vary depending on one's age perception. More specifically, we focus on discrepancies in age perceptions – i.e., differences between birth-date-based chronological age and cognitive age. We believe that our current focus on age is important and timely for the following reasons. It is generally accepted that the global population is aging, at least for most industrially developed countries [57]. As the population ages, discrepancies in age perceptions have also begun to widen. Since the 1950s, research has consistently reported patterns of discrepancies between one's chronological age and cognitive age, and such discrepancies increase with the increase in chronological age [3–6,8,47]. Furthermore, research findings indicate that such discrepancies have potentially significant implications in business [e.g., 5,62], as well as in technology-related attitudes and behaviors [18]. Therefore, we contend that as the age of information technology users increases, we will witness a widening of discrepancies in age perceptions among users, with simple chronological age becoming a less reliable predictor of technology attitudes and adoption [36]. Moreover, as information technology constitutes an integral part of our daily life, the age range of the information technology users is becoming wider than ever (e.g., mobile phone), and it has become imperative to better understand the complex nature of the impact of age on information technology usage and adoption decision patterns in both personal and work use contexts. In short, societal changes and technology trends have rendered age as an important construct in its own right, rather than a secondary variable in explaining important IS phenomena such as technology adoption decision making. Hence, this calls for a more nuanced consideration of age than has been used when age was considered secondary in importance.

The current paper is organized as follows. We first present a review of age measures in prior IS research. The ensuing section presents prior theoretical treatments of cognitive age and individual users' technology acceptance/adoption. Our research model and hypotheses are discussed in the next section, followed by our research methods and results. We conclude with a discussion of our major findings and implications for future research and practice.

2. Use of age in IS research: An assessment of the literature

We first conducted a review of the IS literature to ascertain how widely measures of age were used in prior IS research. To do so, we reviewed over a decade of IS research published in the leading MIS journals – *MIS Quarterly*, *Information Systems Research* and *Journal of Management Information Systems*.

More specifically, we identified all empirical research papers employing primary data collection (i.e., research using surveys, interviews, experiments or a combination of these) that deal with individual-level phenomena (e.g., technology acceptance, IS use, user satisfaction, IT professionals) published in the aforementioned journals between January 1996 and June 2009 – 365 articles from *MIS Quarterly*, 307 articles from *Information Systems Research* and 459 articles from *Journal of Management Information Systems*. From a total of 1131 articles published in these journals, 256 (22.37%) fit our criteria for inclusion in our review. Table 1 summarizes our sample of articles for our literature review by journal and by empirical research approach.

Next, in order to ascertain how the age construct was used in IS research, we categorized each article by noting whether and how age was used in the paper – 1) research participants' (i.e., survey respondents, experimental subjects, or interview informants) age may have been measured and used as an independent variable in the empirical analysis; 2) participants' age may have been measured and used as a moderator variable; 3) age may have been measured and used as a control variable; 4) age may have been collected but not used in the analysis but used to report the participant characteristics (i.e., demographics); and finally 5) age may not have been reported at all. Table 2 summarizes the classification.

Several important observations are obtained from our review of the literature. First and foremost, we note that age is a pervasive measure in IS research. Even if participants' age is not used directly in the empirical analysis as an independent, moderator or control variable, it is usually collected and reported – participants' age was reported in 58.5% of the articles (148 of 253). Second, the review of the literature suggests that despite the significance of the role of age in individual-level IT related phenomena, age has indeed received little attention from IS researchers [59] – participants' age was used as a main modeling construct (i.e., as an independent or moderator variable) in only 3.9% of the articles (10 of

Table 1
Individual-level IS research (1996–2009).

	MISQ	*ISR*	*JMIS*	Total
Survey	42	36	60	138
Experiment	25	37	46	108
Mixed method	0	3	4	7
Total	67	76	110	253

Notes: Mixed method refers to articles that use a combination of empirical approaches – e.g., interview + survey, survey + experiment, and case study + survey.