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Beyond Innovation Characteristics: Effects of Adopter Categories on the Acceptance Outcomes of Online Shopping

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ABSTRACT

Over the past two decades, much research effort has been directed to identifying salient perceptions of innovation characteristics that determine user acceptance of technology, but largely ignored the potential effect of individual adopter differences. According to innovation diffusion theory, some individuals are more likely to adopt an innovation than others because of their differences in individual innovativeness and can be grouped into distinct adopter categories based on their innovativeness. The present research develops a new measure of adopter categories and examines the role of adopter categories in determining user acceptance outcomes (adoption behavior, current use, and future use intention) over and above perceived innovation characteristics in the adoption context of online shopping. More than 400 individuals including 115 business professionals participated in the study. Results obtained through PLS analyses confirm the important role of adopter categories in determining the acceptance outcomes beyond the perceptions of innovation characteristics.

Keywords

Adopter categories, innovativeness, innovation diffusion theory, usefulness, ease of use, compatibility, online shopping, TAM, PLS

INTRODUCTION

A lack of user acceptance of technology has been identified as a key factor underlying the disparity between investments in information systems and derived benefits (Gillooly, 1998; McCarroll, 1991). Over the past two decades, much research effort has been directed to identifying salient perceptions of innovation characteristics that determine user acceptance of technology, but largely ignored the potential effect of individual adopter differences. Extant literature in the studies of innovation adoption suggests that predisposed individual differences can exert lasting effects on the adoption behavior irrespective of the specific characteristics of the technology and also influence the perceptions of those characteristics.

Some individuals are more willing to take a risk and try out an innovation ahead of other members of the system. Others are more suspicious of a new idea and more hesitant to change their current practice (Hurt, Joseph, & Cook, 1977). According to innovation diffusion theory (Rogers, 1995), people react differently to a new idea, practice, or object because of their differences in *individual innovativeness*, predisposed tendency toward adopting an innovation. The adopters belonging to the same category tend to share common characteristics and values with regard to the adoption of an innovation, and people can be classified into distinct *adopter categories* based on their innovativeness,

Applying the concept of adopter categories to the area of technological innovation, Moore (1999) offers various practical guidelines on how to market new products for each type of adopters. Studies on consumer research (Goldsmith & Hofacker, 1991; Hurt et al., 1977; Midgley & Dowling, 1978) agree that individual innovativeness is a persisting characteristic or disposition by which one individual can be distinguished from another. Prior research on innovation adoption and technology acceptance has identified the perceptions of usefulness, ease of use, and compatibility as key innovation characteristics that determine the acceptance of the target technology (Agarwal & Prasad, 1998; Kwon & Zmud, 1987; Parthasarathy & Bhattacherjee, 1998; Tornatzky & Klein, 1982). However, the relationships between adopter categories and those innovation characteristics, and their joint effects on technology acceptance are unknown.

In this research, the significance of adopter categories is examined with regard to three acceptance outcomes: adoption behavior (adoption or rejection), current use, and future intention to use. The extent to which the effect of adopter categories on each of these dependent variables is mediated by the innovation characteristics of usefulness, ease of use, and compatibility is also assessed. If adopter categories were found to have a significant effect over and above the innovation

characteristics, it would mean that the individual innovativeness differences have direct effects on the dependent variable, which cannot be accounted for by just manipulating or influencing the innovation characteristics, and as such, the adopter's innovativeness should be carefully considered in order to improve the particular acceptance outcome. If adopter categories were found to have a significant effect on the innovation characteristics, it would mean that the individual's innovativeness captured by adopter categories is an important determinant of how people perceive the specific attributes of the technology. Thus, directing management attention to capitalizing on this intrinsic tendency would improve the ultimate acceptance of the technology.

The present research examines the role of adopter categories in the context of online shopping. Online shopping enables general public to conveniently acquire a wide variety of products and services via the Internet technology. Unlike the physical marketplace that has been the common stage for economic exchange throughout history, online shopping is a recent development, in which customers have to become accustom to limited sensory access to both products and people. This requires risk-taking and willingness on the part of customers to change their behaviors and accept limitations imposed by the new electronic media in making purchasing decisions, thus representing an adequate context to operationalize the present research. In summary, the objective of the present research is to assess the effects of adopter categories, both direct and indirect effects via the innovation characteristics of usefulness, ease of use, and compatibility, on the multiple acceptance outcomes of adoption behavior, current use, and behavioral intention in the context of online shopping.

CONCEPTUAL BACKGROUNDS AND RESEARCH HYPOTHESES

Figure 1 presents the two conceptual models that guided the formulation of the research hypotheses. The first model proposes adopter categories as a direct determinant of three acceptance outcomes: adoption behavior (adoption or rejection), current use, and future use intention. The second model further proposes that the direct effect of adopter categories on each acceptance outcome will be partially mediated by the innovation characteristics of usefulness, ease of use, and compatibility.

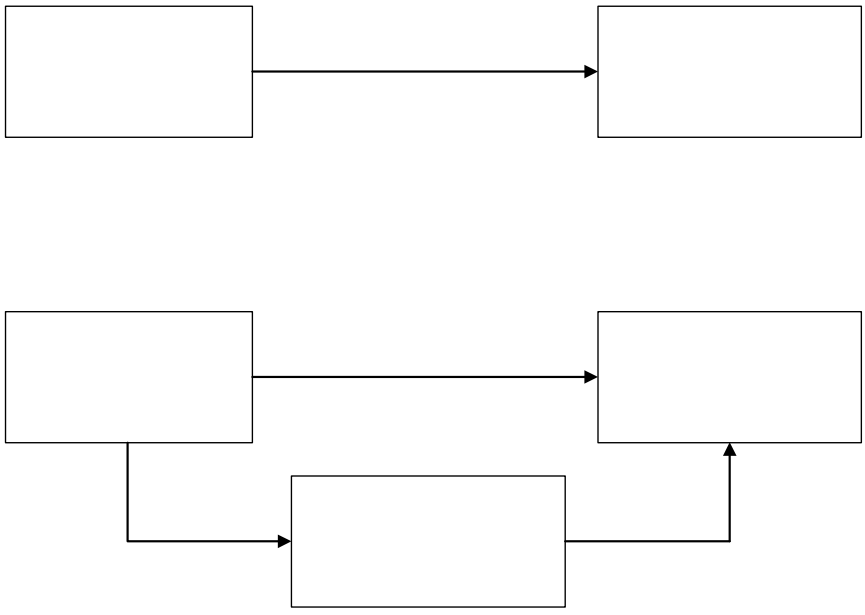

Figure 1. Conceptual Models

Adopter Categories as a Direct Determinant of Each Acceptance Outcome

An innovation is defined as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption. Because it is new, adopting an innovation inherently involves a risk (Kirton, 1976). Some individuals are more likely to take

A. Adopter categories as a direct determinant of each acce

a risk and try out an innovation due to their innovativeness (Hurt, et al, 1977; Rogers, 1995). Based on innovativeness, Rogers (1995) distinguishes adopters into the categories of innovators, early adopters, early majority, late majority, and laggards.

Innovators and early adopters are those who are willing to take a risk of trying out a new idea ahead of other members of the system. They find it easy to imagine, understand, and appreciate the benefits of an innovation. Their adoption decisions are based on their own intuition and vision, rather than well-established references. Thus, innovators and earlier adopters are proponents of radical changes (Kirton, 1976), and disruptive technologies (Moore, 1999). While innovators and early adopters share many similarities, innovators are more risk-taking individuals with more advanced technical knowledge than early adopters. The early majority are primarily driven by a strong sense of practicality. They want to wait and see how other people react to the new idea. In their adoption decisions, well-established references play a critical role. The late majority adopt a new idea when it becomes an established standard. They do not buy unless they are comfortable with their ability to handle the technology. They want to see a lot of support and tend to buy from large well-established companies. Laggards tend to be very cautious about innovations. They adopt an innovation only when it becomes a necessity. Overall, the innovation diffusion research suggests that earlier adopters are more likely to adopt a technological innovation. Therefore, we hypothesize that

H1. Adopter categories will have a positive effect on the adoption behavior of a technology.

In addition to the binary decision of adoption or rejection, we expect adopter categories to be a significant predictor of the amount of the technology use. There can be several reasons for this relationship. First, individuals who are more likely to experiment with new technologies on their own will tend to interact more spontaneously with such technologies and use more often than individuals who are in general cautious about handling technologies. Prior research has found playfulness and enjoyment to be significant determinants of system use (Venkatesh, 2000). Second, earlier adopters are more technically competent and knowledgeable than later adopters. In their development of user competency construct, Macolin, Compeau, Munro, and Huff (2000) theorized user competence as a direct determinant of use. Given their technical competencies and knowledge, earlier adopters can more effectively cope with occasional difficulties that accompany a new technology and develop strategies to overcome them, learning how to successfully utilize the technology. Finally, early adopters are respected by their peers because of their knowledge regarding the technology. Potential adopters look to early adopters for advice and information about the technology (Rogers, 1995). Without frequent use, it is difficult to maintain their status. Therefore, we hypothesize:

H2. Adopter categories will have a positive effect on the current use of a technology.

The technology acceptance model (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989), the theory of reasoned action (Fishbein & Ajzen, 1975), and the decomposed theory of planned behavior (Taylor & Todd, 1995) all concur that behavioral intention, the extent to which an individual intends to perform a specific behavior, is a key variable in determining future behavior. Behavioral intention is an individual's willingness to use (or continue to use) a particular technology. Adopter categories capture individual innovativeness, which is a person's predisposed willingness to tryout a technology. Given its predisposed nature, it is expected to exert its effect on the acceptance decisions across multiple technology domains. Agarwal and Prasad (Agarwal & Prasad, 1998) reported a significant correlation between personal innovativeness in the domain of information technology (PIIT), which was not measured as adopter categories, and behavioral intention to use the Web. Taking a new and alternative approach, we measure adopter categories to capture individual innovativeness and hypothesize that:

H3. Adopter categories will have a positive effect on behavioral intention to use a technology.

Mediating Effects of Innovation Characteristics

According to the innovation diffusion research, perceived characteristics (sometimes called attributes) of an innovation determine the innovation's adoption outcomes. Among the many innovation characteristics proposed, researchers agree that usefulness (also called relative advantage), ease of use, and compatibility are key innovation characteristics (Agarwal & Prasad, 1998; Kwon & Zmud, 1987; Tornatzky & Klein, 1982). The technology acceptance model (TAM) posits that perceived usefulness, the extent to which a person believes that using the technology will enhance his or her job performance, and perceived ease of use, the extent to which a person believes that using the technology will be free of effort, are two key perceptions that determine user intention to accept the technology (Davis, 1989). Substantial empirical support has been accumulated in favor of the TAM over the last decade (see Venkatesh, Morris, Davis, & Davis, 2003 for a recent review), confirming the importance of these two variables as determinants of behavioral intention and use. Although compatibility, the extent to which an adopter perceives an innovation as being compatible with his or her existing values, past experiences, and needs, is not a variable included in the TAM, recent studies on innovation diffusion suggest that compatibility is an important

variable in determining technology adoption outcomes in addition to perceived usefulness and perceived ease of use (Agarwal & Prasad, 1998; Parthasarathy & Bhattacherjee, 1998). Therefore, this research focuses on these three innovation characteristics, and examines their effects in mediating the effects of adopter categories on the acceptance outcomes.

Davis et al. (1989) theorized that external variables such as user characteristics would affect behavioral intention and actual behavior by altering the perceptions of usefulness and ease of use. Similarly, the theory of innovation diffusion posits that earlier adopters more easily envision the potential benefits (usefulness) associated with an innovation than later adopters (Moore, 1999). As a result, earlier adopters can effectively relate the innovative idea or object to their needs, better recognizing the compatibility of an innovation than later adopters. At the same time, given their prior knowledge and technical competence, earlier adopters should consider the same complexity of the technology less daunting. Thus, adopter categories are likely to positively influence the perceptions of usefulness, ease of use, and complexity, which in turn determine the acceptance outcomes.

The degrees of mediation by these innovation characteristics between adopter categories and acceptance outcomes are relatively unknown. The innovation diffusion literature (Goldsmith & Hofacker, 1991; Hurt et al., 1977; Moore, 1999; Rogers, 1995) suggests that the predisposed tendencies toward an innovation will be carried over from one innovation to another, and the personal trait of individual innovativeness will be an invariant factor in the adoption decision across multiple innovations. In addition, social factors such as social norm and degree of social network interconnectedness can influence innovation adoption outcomes (Fishbein & Ajzen, 1975; Rogers, 1995). Thus, the effect of adopter categories on acceptance outcomes may not be fully mediated by the innovation characteristics. Consequently, we hypothesize that

H4. The innovation characteristics of usefulness, ease of use, and compatibility will partially mediate the effect of adopter categories on adoption behavior (H4a), current use (H4b), and behavioral intention (H4c).

METHOD

The study was conducted in a field study setting using a survey methodology. Data were collected from 412 participants consisting of 115 workers at two business organizations (one in the medical industry and one in the IT industry) and 297 undergraduate and MBA students at a large state university in the U.S. The overall response rate was 77.4%. The positions held by the workers were diverse including supervisor, financial counselor, IS director, and vice president.

For adopter categories, participants were asked to identify a category that was most applicable to the respondent from the four adopter category descriptions shown in Table 1 and were coded as an ordinal scale (1 = laggards, 2 = late majority, 3 = early majority, 4 = innovative adopters) for analysis. The instrument does not distinguish between innovators and early adopters because the innovators category represents only a very small portion of population, and innovators and early adopters share much similarity (Brancheau & Wetherbe, 1990; Moore, 1999). Category labels were deliberately omitted from the questionnaire to avoid any connotations the labels might possess.

Adopter Category	Description
Innovative Adopters	You buy into a new product's concepts very early in its life cycle. You find it easy to imagine, understand and appreciate the benefits of a new technology and base buying decisions upon this belief. You do not base these buying decisions on well-established references, preferring instead to rely on your own intuition and vision.
Early Majority	You share some of the previous category's ability to relate to technology but are ultimately driven by a strong sense of practicality. You know that many newfangled inventions end up as passing fads, so you are content to wait and see how other people are making out before you buy in yourself. You want to see well-established references before investing substantially.
Late Majority	You do not buy unless comfortable with your ability to use the technology. As a result, you wait until something has become an established standard, and even then you want to see lots of support and tend to buy, therefore, from large, well-established companies.
Laggards	You are very cautious about new technology. You will only purchase when you feel it has become a necessity.

Table 1 Adopter Category Description

For the acceptance outcomes, the survey included questions about whether the respondents ever purchased online (adoption behavior), and if they did, how many times they have purchased goods online in the past three months (current use).

Behavioral intention was measured by three items adopted from prior research (Agarwal & Prasad, 1999; Davis, 1989; Taylor & Todd, 1995). The survey questionnaire also included three-item scales for each of the innovation characteristics of usefulness, ease of use, and compatibility, which were adopted from prior research and tailored to fit the domain of online shopping.

The average age of the participants was 25, ranging from 18 to 58. The majority of the participants (78%) had an experience of online shopping. An average online shopper had purchased 2.4 times within the past three months from the response time. Of the 412 participants, 49 were innovative adopters, 221 were early majority, 102 were late majority, and 40 were laggards. The percentages of innovative adopters (12%) and laggards (10%) were similar to the percentage expected by the theory of innovation diffusion (16%).

RESULTS

PLS-Graph (Chin & Frye, 1998) was employed for measure validation and hypotheses testing. Before testing the hypotheses, psychometric properties of the measures for the seven study constructs were evaluated through confirmatory factor analysis. The internal consistency reliabilities of the study variables were all greater than .90, surpassing the .70 minimal reliability criteria (Agarwal & Karahanna, 2000; Chin, 1998). As strong evidence of convergent and discriminant validity, the square root of the average variance extracted for each construct was greater than .707 and greater than the correlation between that construct and other constructs, without exception. The factor structure matrix analysis also confirmed that all items exhibited high loadings on their respective constructs (the minimum loading was .90) and no items loaded higher on constructs they were not intended to measure. In sum, the measured scales exhibited excellent psychometric properties with high reliability, and strong convergent and discriminant validity.

All the proposed hypotheses were assessed by examining path coefficients and their significance levels generated by PLS-Graph. Supporting H1, adopter categories had a significant effect on adoption behavior ($\beta = .31$, $p < .001$). Because the adoption behavior is a binary response variable (adoption or rejection), the logistic regression technique was also used for the cross-validation of the result, confirming the significant effect ($b = .94$, $p < .001$). Supporting H2, adopter categories had a significant effect on current use ($\beta = .22$, $p < .001$). Supporting H3, adopter categories exerted a significant effect on behavioral intention ($\beta = .33$, $p < .001$).

H4 hypothesized that usefulness, ease of use, and compatibility would partially mediate the effect of adopter categories on adoption behavior (H4a), current use (H4b), and behavioral intention (H4c). According to Baron and Kenny (1986), the following three conditions must hold in order to establish full mediation: (1) a significant relationship exists between the independent variable and the dependent variable; (2) a significant relationship exists between the independent variable and the presumed mediator; and (3) in the presence of a significant relationship between the mediator and the dependent variable, the previous significant relationship between the independent variable and the dependent variable is no longer significant. When the first two conditions are met, and both independent variable and the mediator are significantly related to the dependent variable for the third condition, it is the case of partial mediation. The results of the hypothesis testing conducted above for H1-H3 satisfy the first condition for each acceptance outcome. Satisfying the second condition, adopter categories had a significant effect on usefulness ($\beta = .38$, $p < .001$), ease of use ($\beta = .19$, $p < .001$), and compatibility ($\beta = .22$, $p < .001$). The third condition was tested by regressing each acceptance outcome on usefulness, ease of use, compatibility, and adopter categories. Partially supporting H4a, for adoption behavior, usefulness and adopter categories were found significant ($\beta = .48$, $p < .001$ for usefulness; $\beta = .13$, $p < .01$ for adopter categories). The logistic regression analysis confirmed the significant effects ($b = .88$, $p < .001$ for usefulness; $b = .50$, $p < .01$ for adopter categories). Partially supporting H4b, for current use, usefulness and adopter categories were found significant ($\beta = .27$, $p < .001$ for usefulness; $\beta = .13$, $p < .01$ for adopter categories). Partially supporting H4c, for behavioral intention, usefulness, compatibility, and adopter categories were found significant ($\beta = .53$, $p < .001$ for usefulness; $\beta = .12$, $p < .05$ for compatibility; $\beta = .10$, $p < .05$ for adopter categories). Figure 2 summarizes the hypotheses testing results.

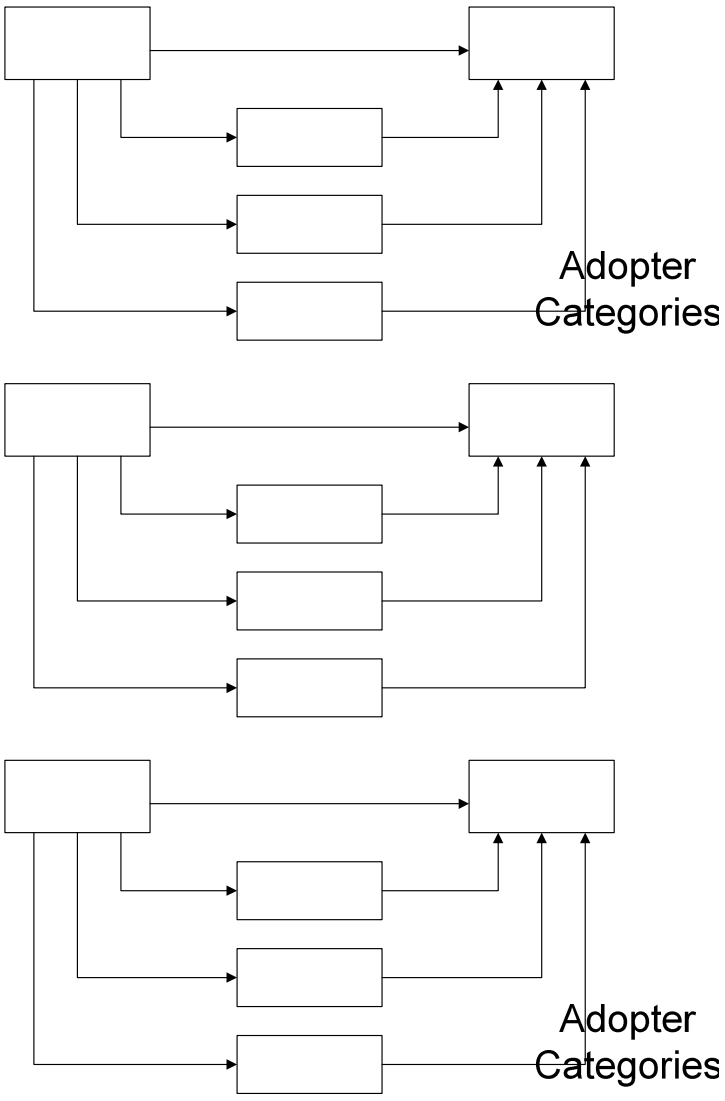

Figure 2. PLS Testing Results

DISCUSSION

Supporting H1, H2, and H3, the present study found that adopter categories had a significant effect on each acceptance outcome of adoption behavior, current use, and future use intention. The significant effect of adopter categories on each of these outcomes was partially mediated by a subset of innovation characteristics, partially supporting H4. Specifically, usefulness was a partial mediator of the effect adopter categories had on adoption behavior (H4a) and on current use (H4b), and usefulness and compatibility were partial mediators of the effect adopter categories had on behavioral intention (H4c). On each acceptance outcome, adopter categories had a significant direct effect over and above the three innovation characteristics as well as indirect effects via the innovation characteristics.

The findings of the present study clearly demonstrate the important role individual innovativeness captured by adopter categories plays in determining user acceptance of an IT-based innovation. Given that many studies have examined and confirmed the significant effects of innovation characteristics in determining user acceptance of technology, it is noteworthy that the effect of adopter categories on adoption behavior, current use, or future use intention was not fully mediated by the widely-studied innovation characteristics. Our research confirms the significant effects of the usefulness and compatibility

beliefs in forming user intentions to adopt and use an innovation, but also demonstrates that individual innovativeness differences exert a significant effect over and above those salient innovation characteristics.

Recent studies extended innovation and technology adoption studies by identifying various antecedent variables and relating them to usefulness, ease of use, or compatibility. Those studies focused on innovation characteristics (Venkatesh & Davis, 2000), system characteristics (Dishaw & Strong, 1999), culture (Straub, 1994), and descriptive personal traits such as educational backgrounds (Agarwal & Prasad, 1999) and gender (Gefen & Straub, 1997). Our findings show that individual innovativeness is a significant antecedent of usefulness, ease of use, and compatibility. This would mean that highly innovative individuals have a predisposed tendency to perceive the same technology more useful, easier to use, and more compatible because of their innovativeness, which is consistent with the individual characteristics of earlier adopters conceptualized by the theory of innovation diffusion (Rogers, 1995).

The present research developed and validated an instrument to measure individual innovativeness following the conceptualization of Roger's (1995) adopter categories. The instrument appears to be the first to assess individual innovativeness by explicating the attributes of adopter categories regarding technology adoption. The adopter category measure facilitates identification and description of distinct profiles of adopter categories based on their innate innovativeness. It also avoids many of the problems associated with the time of adoption measure such as *post-facto* description of the behavior, confounding with environmental and situational factors, inaccurate recalling, and limited generalizability, while directly tapping into inherent individual innovativeness toward the adoption of technological innovations. The theory of innovation diffusion (Rogers, 1995) suggests an "audience segmentation" strategy in which different communication channels or messages are used to appeal to each adopter category. Moore (1999) extends the idea of segmentation strategy to recommend a high-tech market to be developed from the innovative adopters and moved on to the early majority, late majority, and even to the laggards, and further propose various strategies to be used for each adopter segment. The adopter category measure can be used to meaningfully classify potential adopters into sub-groups, which have different implications for technology implementation and support. Given that a reliable segmentation of the adopters is a crucial precursor to an effective execution of customized implementation strategies and targeted support efforts, the newly developed adopter category measure can be of significant value to many practitioners who endeavor to successfully introduce or manage new technologies.

Several limitations of the present research should be noted. First, the present research examined whether the effect of individual innovativeness was mediated by usefulness, ease of use, and compatibility. In addition to these variables, innovation diffusion studies suggest a number of other variables as potentially important in the context of innovation adoption and diffusion including image, result demonstrability, visibility, trialability, divisibility, communicability, cost, and profitability (Rogers, 1995; Tornatzky & Klein, 1982). We do not know how these variables might have affected our findings or how they are related to the adopter categories. Future research should consider the possible role of additional mediators beyond usefulness, ease of use, and compatibility linking adopter categories to behavioral intention. Second, we found that the distribution of the adopter categories was skewed toward the early majority. This might be due to the characteristics of the samples we used. The participants were more highly educated than the population in general. In addition, the skewness might be a reflection of the diffusion status of the innovation at the time of the study. Future research is needed to systematically examine the relationships between sample characteristics, innovation diffusion status, and adopter distribution patterns. Finally, we did not survey user responses at multiple times. While our approach is consistent with prior studies (e.g., Agarwal & Karahanna, 2000), and avoids methodological problems associated with the multiple administration of the same instrument (Cook & Campbell, 1979), future research may take a longitudinal approach and trace how the strengths of the direct and indirect effects of adopter categories on acceptance outcomes change over time, although we expect the overall significant role of individual innovativeness remains true given its predisposed nature of the construct.

CONCLUSION

The present research has demonstrated the important role of individual innovativeness in influencing the adoption decision of a technology-based innovation. The study results show that individual innovativeness affects acceptance outcomes (1) indirectly by altering user perceptions of the innovation characteristics of usefulness, ease of use, and compatibility, and (2) directly by exerting its influence over and above those innovation characteristics. The findings clearly indicate that adopter's innovativeness differences should be taken into account to facilitate the adoption of technological innovations. In this effort, the newly developed measure of adopter categories should be invaluable for grouping individuals with similar predisposed tendencies toward adopting an innovation and subsequently developing effective implementation and support strategies.

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