

# **Are There Differences Between Men and Women in Information Technology Innovation Adoption Behaviors: A Theoretical Study**

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*This study explores the impact of gender on Rogers (1995) innovation diffusion characteristics associated with innovation adoption behaviors toward a new information technology innovation adoption. Innovation diffusion theory was used to theoretically extend the information technology adoption literature. Using fourteen propositions a research framework is suggested that draws upon Rogers' (1995) innovation diffusion characteristics (relative advantage, compatibility, complexity, trialability and observability). The key argument is that Rogers' innovation diffusion characteristics are differently impacted by gender on their influence on information technology adoption behaviors.*

## **INTRODUCTION**

The need to understand innovative information technology adoption is becoming more important as competition increases, profit margins tighten and pressures to increase productivity continue in today's manufacturing organizations (Kuo & Yen 2009, Yi, Jackson, Park & Probst 2006, Moore & Benbasat 1991). Innovation adoption has been defined as a decision to make full use of an innovation (Rogers 1995) and entails commitment of resources in support of that process (Grover and Goslar 1993). There is an expectation that productivity outcomes will result from the introduction of new technologies leading to future organizational effectiveness (Ansoff 1980).

Gender issues become salient in understanding technology adoption issues since women constitute 46% of the labor force (U.S. Census Bureau 2003). Significant differences were found between women and men regarding expectations from new technology at work with men being more optimistic than women (Pew 2013, Pew 2005, Hackett, Mirvis and Sales 1991). Women have also been found to be more risk averse than men (Johnson and Powell 1994; Byrnes, Miller and Schafer 1999).

The interaction of a person and machine is affected by the characteristics of both (Card, Moran and Newell 1983) and previous research has documented gender differences in terms of adoption of technology, especially information technology (Flanagin and Metzger 2003; Thompson and Lim 1996; Whitley 1997). A longitudinal field investigation found clear gender differences in the salience of various factors determining an individual's information technology adoption decisions in the work place (Venkatesh, Morris and Ackerman 2000). According to the Venkatesh et al. (2000) study, attitude toward the technology was more salient to men who experienced little influence through subjective norms, whereas women were strongly influenced by subjective norms and perceived behavioral control. Other

studies found the perceived usefulness of the technology or its relative advantage to be more significant for men than for women, both in the short and long term, in decisions related to technology adoption (Trauth, Nielsen and Von Hellens 2003; Venkatesh and Morris 2000).

## **PURPOSE OF THIS STUDY**

This study explores the influence of gender on the relationship between the characteristics of innovation diffusion and technology adoption.

The questions investigated by this study are whether the:

- characteristics of diffusion of innovation influence information technology adoption, and;
- relationships between the characteristics of diffusion of innovation and technology adoption is similar for men and women.

By comparing differences in adoption of an information technology innovation between men and women, this study attempts to further the understanding of the factors leading to adoption of innovation, especially in the context of information technology based innovations.

## **GAP IN RESEARCH**

Previous research has suggested that there may be differences between men and women in terms of their attitudes toward using technology, especially information technology (Schottenbauer, Rodriguez, Glass and Arnkoff 2004, Gefen & Straub 1997, Whitley 1997, Lim & Teo 1996). In organizational context, women's reactions have been found to be different from those of men, as a consequence either of some unspecified psychological factors or of different sex-role socialization (Lefkowitz 1994). However, the previous research has generally been conducted in the context of relatively well established technologies which had already found acceptance in society and whose advantages were too well known such as internet usage or e-mail. This study looks at the factors relevant to the adoption of information technology, especially those in the framework of the Rogers' (1995) theory of innovation diffusion for new information technology innovations for which previous information might not be available. Investigation of the role of gender on factors influencing technology utilization can help in designing gender neutral technologies and systems. Such technologies may be implemented with greater generalized acceptance and utilization across genders.

In addition, a lot of previous research (Hardgrave, Davis, & Riemenschneider 2003, Menanteau and Lefebvre 2000; Schumacher and Martin 2001;) has been limited to behavioral intentions of potential users rather than investigating real utilization behavior. Actions are controlled by intentions, but not all intentions are carried out; some are abandoned altogether while others are revised to fit changing circumstances (Ajzen 1985). The Innovation Diffusion Theory (Rogers 1995, 1962) has traditionally been applied to explain behavioral intentions, not the actual action of adoption. This study proposes that the Innovation Diffusion Theory can be used for predicting likelihood of adoption as well. This study recognizes that the studies investigating innovation adoption have generally chosen behavioral intention to adopt, or a dichotomous single instance adoption/non-adoption as their dependent variable. However, intention is not a very reliable measure of action (Ajzen 1985) and the latter is not a very precise measure as actual true adoption of an innovation could be a function of the number of attempts to adopt (Downs and Mohr 1976). True long term adoption is also very challenging to measure even though long term adoption comes closer to capturing the behavior of adoption. This study focuses on likelihood of adoption instead of intention to adopt since likelihood of adoption can be considered a stronger measure. Likelihood of adoption can be defined as strong inclination of a user to start using the innovation on a regular basis based on previous interaction with that innovation.

Next, the underlying theory of characteristics associated with the Innovation Diffusion Theory by Rogers (1962) is described which forms the antecedents of technology utilization in this study.

## INNOVATION DIFFUSION THEORY

The Innovation Diffusion Theory (IDT) proposed by Rogers (1962, 1983, 1995, 2003) enabled researchers to investigate how new innovations spread among people (Eastin 2002). Rogers (1962) identified five general characteristics of innovations that a variety of diffusion studies (Brown, Cajee, Davies and Stroebel 2003; Lee and Runge 2001; Premkumar and Roberts 1999; Shelley 1998; Weiss and Dale 1998, Strutton, Lumpkin & Vittell 1994) have shown to consistently influence adoption. These five attributes are: (1) relative advantage; (2) compatibility; (3) complexity; (4) trialability; and (5) observability. This paper proposes that these five attributes are likely to influence likely adoption of an information technology innovation. The relationship between characteristics of diffusion of innovation and utilization is proposed to be influenced by the gender of the potential adopter.

### Relative Advantage

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes (Rogers 1982). The nature of the innovation largely determines the specific type of relative advantage obtained from the innovation, such as economic or social is important to adopters, although the characteristics of the potential adopters also affect which dimensions of relative advantage are most important. A study involving the diffusion of expert systems found relative advantage to be an important factor (Armstrong and Yokum 2001). Relative advantage offered by adopted system was found to contribute most to attitudes and satisfaction (Al-Gahtani and King 1999).

Gender issues in relative advantage through using information technology such as computers, internet are predicated on the type of use. The research done on internet usage, which is widely prevalent in society today among all strata and categories, provides promising clues toward understanding how men and women react to innovative information technology. Internet usage research has shown that women are more intensive users of information technology for social and human networking reasons than men (Pew 2013) whereas men are more intensive users of information technology for informational and utilitarian reasons (Pew 2005). Since in this study we are focusing on voluntary use of information technology, it may be surmised that in a generalized sense, women prefer using information technology largely to satisfy their bonding and sharing nature whereas men prefer using information technology essentially as an enabling tool that enhances their abilities to negotiate life through informational pools. Accordingly, relative advantage of information technology arises for women from being a better alternative to previous means to connect with others whereas for men it arises from being a better alternative to their previous information sharing pools such as plumber or mechanic friend or “how to do” magazines. Therefore, this study proposes that:

*P1: Ability to provide superior social interaction ability will be positively related to greater adoption of information technology innovation by women*

*P2: Ability to provide superior informational and utilitarian resources will be positively related to greater adoption of information technology innovation by men*

### Compatibility

Compatibility represents the degree to which an innovation is perceived as being consistent with the existing values, past experience, and needs of potential adopters, according to Rogers (1983). An idea that is more compatible is less uncertain to the potential adopter. Compatibility of an innovation with a preceding idea can accelerate its rate of adoption.

In a study, Amish farmers were found to more frequently adopt sustainable agricultural practices compared to non-Amish farmers due to their compatibility with such practices (Sommers and Napiers 1993). In a study involving the adoption of cell phones, user compatibility with such non-stationary phone usage was found to be an important factor in cell phone adoption (Vishwanath and Goldhaber 2003) and in a study regarding adoption of internet by companies, technology compatibility was found to be an important factor (Teo and Pian 2003). In a study of digital cable adopters, it was found that the

compatibility of users with the content received through digital cable affected their satisfaction with the adoption of that innovation (Kang 2002). The adopters who are compatible with an innovation should be favorably disposed towards and are likely to be satisfied since they are fulfilling their expectations without having to reorient their preferences towards the new technology.

Pew study (2005) titled “How Women and Men use the Internet”, describes key differences between women and men in their use of Internet based services. According to the Pew study, women are more enthusiastic online communicators compared to men, and they use email more extensively. Women are more likely than men to use email to communicate with friends and family about a various topics: sharing news and feelings, planning events, forwarding interesting popular content. More importantly, women are more likely to feel satisfied with the role email plays in their lives, especially when it helps them nurture their relationships. Also, women include a greater range of topics and activities in their personal emails. Men use email more than women to communicate with different kinds of organizations.

Thus by observing the way women use internet based email, it can be reasoned that women are more compatible with technology that allows their feminine side to express itself. Women find technology that allows them to share, communicate and nurture their social connections more compatible. Men are not as motivated to using technology for social purposes than as a means to conducting affairs of their life. The Pew (2005) study claims that men are more likely to use the internet to pay bills, participate in auctions, trade stocks and bonds, and pay for digital content. Thus for women, the new information technology innovation must be compatible with their social needs, whereas for men, new information technology must be compatible with their utilitarian needs.

Thus two propositions arise from above discussion:

*P3: Feminine compatible attributes of an information technology innovation will be positively related to greater adoption of such information technology innovation by women*

*P4: Utilitarian attributes of an information technology innovation will be positively related to greater adoption of such information technology innovation by men*

## **Complexity**

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use (Rogers 1982). Any new idea may be classified on the complexity-simplicity continuum. Some innovations are clear in their meaning to potential adopters while others are not. Complexity of an innovation is negatively related to its rate of adoption (Tornatzky and Klein 1982). The complexity of an information technology discourages a user (Cheung, Chang and Lai 2000). Cheung et al. found that complexity had a significant negative effect on usage, near-term consequences, long-term consequences, and even affect. Complexity may be defined in terms of the abilities of the task-doer, complexity does not exist in an absolute sense (March and Simon 1958).

Not many studies have investigated how men and women differ in negotiating technological complexity. However, Pew (2005) provides a clue. The Pew study states that women overcome perceived complexity of internet by gathering and exchanging information through support groups and personal email exchanges. No such claims are made regarding men leading to the conclusion that men are more likely to take a more individualistic approach when encountering technological complexity. A study investigating technology overload found that women knowledge workers perceived technology overload negatively affected their job performance, more so than men (Karr-Wisniewski, Carroll, Lipford 2011). Hence, it may be argued that women do find overly complex technology more cumbersome to handle than men. Women, therefore, prefer to negotiate technology complexity through a social support network and quite possibly have greater negative perceptions of overly complex technology compared to men. Therefore, it is likely important to women that they have social support availability when dealing with the complexity of a new technology. As such, it may be proposed that:

- P5: Complexity of an information technology innovation will be negatively related to adoption of such information technology innovation by women*
- P6: Availability of a social support system will be positively related to adoption of an information technology innovation by women*
- P7: Complexity of an information technology innovation will be negatively related to adoption of such information technology innovation by men*

### **Trialability**

According to Rogers (1983) trialability is the degree to which an innovation may be experimented with on a limited basis. New ideas that can be tried on the installment plan will generally be adopted more rapidly than innovations that are not divisible. An innovation that is more trialable is less uncertain for the adopter as it helps defray the expected costs of adopting a new technology and thereby enhances its appeal to those who might be willing to experiment with a new technology. It was found that trialability significantly impacted the intended use of a personalized web site (Greer and Murtaza 2003). A study of innovative e-learning found trialability to be a strong predictor of its acceptance (Lewis and Orton 2000). Trialability aspect of a new technology, using prototypes to familiarize potential users with it before eventual deployment can be critical to its future adoption and use (Boddy and Buchanan 1986). Socialization with the new technology is related to reduction of anxiety and tension amongst those who might be exposed to working with a new technology (Goodman, Griffith and Fenner 1990). In a study regarding impact of trialability of a product on information search behavior, it was found that users were more easily satisfied when there was scope for trialability compared to the instances when no such opportunity was available (Park, Assael and Chaiy 1987). Trialability leads to greater exposure to new technology which in turn has been found to be associated with improvement in job satisfaction (Axtell, Wall, Stride, Pepper, Clegg, Gardner and Bolden 2002).

Pew (2005) study states that men usually pursue many internet activities more intensively than women, and that men are still more proactive in trying the latest technologies. It is possible, however, that the key to greater trialability by men is the origin of the information regarding a new technology in question. While men are more likely to give a new technology a try, it could be because most new technologies are likely to be discussed first in male centric media. Women may be less likely to try a new technology before men because they might become aware of such technology from their male associates or family members. In any case trialability is important to the success of an information technology innovation and is quite likely to be induced through the reviews of early users. These trial based reviews are likely to seed the subsequent generalized usage of the new technology. Such early reviews could easily be polarized toward male perceptions of the new technology since they are likely to be the earlier users. Hence, for women, trying an information technology innovation might become more likely if referred to by female users than male users. Thus it may be proposed that:

- P8: Trialability of an information technology innovation will be positively related to adoption of such information technology innovation by women*
- P9: Trialability of an information technology innovation will be positively related to adoption of such information technology innovation by men*
- P10: Trialability of an information technology innovation by women will be positively related to inducement from women early users*
- P11: Trialability of an information technology innovation by men will be positively related to inducement from male centric information sources*

### **Observability**

Observability represents the degree to which the results of an innovation are visible to others (Rogers 1983). The more visible the results of an innovation, the more likely the innovation will be quickly adopted and implemented. Potential adopters want to see observable results of an innovation. The rapid adoption of cellular phones in United States may be assigned to extensive observability of this technology

in public places to potential adopters (Rogers 1995). Observability is a vicarious experience in its pure form. People learn outcome-behavior relationships through direct experience and also through observing experiences of others vicariously (Bandura 1977). Observability allows potential adopters an opportunity to appraise an innovation indirectly by making assessments of switching costs and social relevance related to that innovation (Strutton, Lumpkin, and Vitell 1994). Observability especially influences late adopters of an innovation (Vishwanath and Goldhaber 2003). It is likely that people interpret signals emanating from others' use of the innovation in terms of its perceived usefulness.

As discussed earlier that women are prone to using their social network support system when interacting with a new technology, it bears to reason that observability is likely to be a major incentive for women to adopt a new information technology. The ability of the social support group to demystify the intricacies of a new technology to a new female user is likely to provide strong incentive to adopt. Regarding men, they are less likely to be the beneficiaries of a social support group or may be less likely to seek the support of such social support group, thereby making this less important to them, but important all the same. However, in favor of men it may be said that they may seek more information regarding a new information technology on their own than women. Thus, it may be proposed that:

*P12: Observability of a new information technology will be positively related to adoption of such information technology by women*

*P13: Observability of a new information technology will be positively related to adoption of such information technology by men*

*P14: Observability of a new information technology will be positively related to availability of a social support system to women users.*

## CONCLUSION

The above discussion refers to the innovation diffusion characteristics that influence adoption of an innovation and how gender affects them. The innovation diffusion characteristics are likely influence men and women differently. The suitability of a new information technology to social purposes is likely to enhance its appeal to women adopters. Also, availability of a social support network might enable women to negotiate the complexity of a new information technology innovation and improve its adoption potential among them. Men are likely to be more influenced by the utilitarian and informational aspects of a new information technology innovation than its social advantages. A practical implication of the above discussion is that the sponsors of a new information technology innovation might want to target men and women differently. Even though there are some exceptions, usually the features of a new information technology launch campaign are gender neutral. Launchers of a new information technology innovation may benefit from social networking approach to inducing women users toward adoption while emphasizing utilitarian and information characteristics of that innovation to men adopters.

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