

Social Influence on Knowledge Worker's Adoption of Innovative Information Technology

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Abstract

User perceptions toward information technology (IT) are crucial to successful implementation. The purpose of our study is to improve the understanding of the impact of social influences on different types of users' perceptions and adoption of IT. To do this our study refines and expands the operationalization of the social influence construct to include four components: "subjective norm", "image", "visibility", "voluntariness". We use this to examine influences by type of user (knowledge worker versus university student) and IT (innovative versus mature). The key finding is that when knowledge workers consider adopting innovative IT they are sensitive to general perceptions of its usefulness. Our results have implications for management enquiry and practice.

Keywords:

IT, users, social influence, subjective norm, knowledge workers

Introduction

The purpose of our study is to improve understanding of the impact of "social influence" on different types of users' perceptions and adoption of information technology (IT). To do this our study refines and expands the operationalization of the social influence construct to include four components: subjective norm, image, visibility, voluntariness. We use this to examine influences by type of IT (innovative versus mature) and user (knowledge worker versus university student). This is an important topic as IT is crucial to business and user perceptions towards IT are crucial to its successful implementation. Also, in recent years much economic growth has occurred in fields in which knowledge workers are the key factor of production (Drucker, 1997; Cohen & Levinthal, 1990; Prahalad & Hamel, 1992; Amit & Schoemaker, 1993; Hall, 1992). Therefore, we focus on the effect of social influence on knowledge workers' beliefs and IT adoption.

Problems in Studies about Social Influence on IT Adoption

Research on the adoption and implementation of organizational IT shows user attitudes toward the innovation are important to success (Lucas, 1981). According to Innovation-Diffusion Theory the rate at which an innovation is adopted is highly dependent not only on the user's beliefs toward that innovation (Rogers, 1983), but also on social influence (Fulk et al., 1987). However, empirical tests of social influence on attitudes toward IT have produced mixed results. While Svenning (1982) found positive influences from the subjective norm on user attitudes to use, Pease (1988) found no influence (using the same video conferencing system). These controversies are noticeable in the Technology Acceptance Model (TAM).

We believe the reasons for these contradictory results are as follows. First, social influence theories in IT research fail to provide explicit and exact definitions of social influence (Rice & Aydin, 1991). Second, the referents of social influence are not clearly defined. Social influence means that socially referent others can influence workers' perceptions of, and reactions to, jobs (Shaw, 1980). However, in this definition it is not clear who are the socially referent others. Third, the confusing results about social influence on intention to use imply that various conditions or mechanisms are at work (Davis et al, 1989). One of the possible conditions concerns user characteristics such as demographics, job characteristics, IT experiences, and so on.

Thus, we look at knowledge workers to investigate whether they are sensitive to social influence in their internalization process of IT adoption. In order to investigate the internalization process of knowledge worker's IT adoption we conducted two comparative studies. We compared the internalization processes of knowledge and non-knowledge workers. Next, we compared the adoption of innovative versus mature IT. With these comparative studies we can identify more clearly how knowledge workers, who are anxious to enhance the productivity of their unstructured tasks, intend to adopt innovative IT for the sake of task productivity.

Theoretical Background

Social Influence

Perceptions of IT are likely to be influenced by the objective characteristics of the system, individual differences (e.g., experiences), and extent of use of the system. However, social influence theories argue that individual perceptions are also likely to be influenced by the opinions, information and behaviors of salient others (Salancik & Pfeffer, 1978) and socially referent others. From this perspective our literature review showed that individual beliefs and intentions to use IT are vulnerable to the following four kinds of social influence: subjective norm, image, visibility, and voluntariness.

First, **subjective norm** is the most popularly measured construct of social influence in IT acceptance theories such as the TAM, Theory of Reasoned Action (Fishbein & Ajzen, 1975) and Theory of Planned Behavior (Ajzen, 1985). Individuals allow themselves to be influenced by observing others and/or seeking information from others, particularly for uncertainty reduction. However, the actual source of greatest influence remains vague because there is no definitive way of establishing the "referent." Social Information Processing Theory postulates that the influence of socially constructed meanings is affected by factors such as the other's credibility, status (Shaw, 1980) and perceived and/or informal power (Brass, 1984). "Proximity" is also a criterion for the referent and their significance. Proximity is the extent to which one could be exposed to social information in a given social system and includes three elements: relational, positional and spatial proximity (Rice & Aydin, 1991). From these factors it can be inferred that the referent is a person who has some power by virtue of some specific status and a history of close relationship and whose trustworthiness has been proven through their past relationships.

Second, **image** is "the degree to which adoption of the innovation is perceived to enhance one's image or status in one's social system" (Moore & Benbasat, 1991). The subjective norm positively influences image because if important members of a person's social group at work believe they should perform a behavior, execution of such performance can elevate their standing within the group. Increased status within the group is a basis of power and influence, which in turn provides a general basis for greater productivity. Thus, an individual may perceive that using IT will lead to improved job performance, even though benefits result from image enhancement rather than the attributes of the IT (Venkatesh & Davis, 2001; Pfeffer, 1982).

Third, **visibility** is "the degree to which the innovation is visible in the organization": i.e., the more familiar a potential adopter is with an innovation the more likely they are to adopt it (Moore & Benbasat, 1991). Visibility is a closely related concept to "observability" (Rogers, 1983) and "critical mass" (Markus, 1990). These denote that the dominant number of users in an organization

influences a user's perception and usage of IT.

Finally, **voluntariness** is "the extents to which potential adopters perceive the adoption decision to be non-mandatory" (Rogers, 1983; Moore & Benbasat, 1991; Venkatesh & Davis, 2001). Voluntariness makes the assumption that external pressure affects IT adoption. Moreover, we considered these four constructs as the formative indicators of social influence.

Knowledge Worker

Knowledge workers quickly identify the value of knowledge and apply it in the interest of productivity (Nonaka, 2000). A knowledge worker is a different kind of employee characterized by being paid not to create, produce or manage a tangible product and/or service, but rather to gather, develop, process and apply information that generates profitability to the enterprise (Smith and Rupp, 2004). Quinn et al.(1996a; 1996b) suggested that knowledge workers create most of the professional intellect of organizations and operate on the following four levels (in increasing importance): 1) cognitive knowledge or basic mastery of a professional discipline, 2) advanced skills or the ability to translate theory into effective execution or practice, 3) systems understanding or the deep knowledge of the cause and effect relationships underlying the professional discipline, 4) self-motivated creativity or the motivation and adaptability for success. Thus, knowledge work is cognitive rather than physical and constitutes a high mental activity with specific work characteristics. As a contrast to knowledge workers with such characteristics we used college students. College students are required to complete assignments whose solutions or answers are already defined in very structured ways whereas knowledge workers are required to make improvised and ad hoc decisions in competition for unstructured future objectives. The tasks of college students lack creativity and nimble judgment and require them to find out the expected right solutions (Johnson & Levenburg, 1994).

Research Hypotheses

Social Influence versus PU, PEU and Intention

Davis et al. (1989) focused on PU and PEU because they represent the process and mechanism of internalization of the characteristics of IT. All external variables must influence PU and PEU before they can lead to intention to use. External variables include both the technical and non-technical characteristics of IT, such as social influence. The subjective norm affects internalization of IT because when one perceives that an important referent thinks one should use a system, one incorporates the referent's belief into one's own belief structure (Warshaw, 1980). From the perspective of image one recognizes usefulness if IT usage is believed to enhance social status (Venkatesh & Davis, 2000). The argument that late adopters' PU and PEU are influenced by surrounding early adopters indicates the

influence of visibility (Fisher & Price, 1992). Voluntariness has a direct effect on user's beliefs of IT (Agarwal & Prasad, 1997). Therefore, we make the following hypotheses.

H1: Social influence has a significant impact on the PU of both innovative and mature IT in both knowledge and non-knowledge groups.

H2: Social influence has a significant impact on the PEU of both innovative and mature IT in both knowledge and non-knowledge groups.

Some TAM studies included the social influence construct as an exogenous variable in the model even though the path structure around social influence has not been uniform (Lucas & Spittler, 1999; Venkatesh & Davis, 2000). TAM, TRA and TPB propose a direct relationship between the subjective norm and intention to use. For example, when the expected results of using IT are uncertain, users use IT in compliance with their referent. Also, visibility influences the diffusion of innovations (Moore & Benbasat, 1991). In this context it seems that the social influence influences the intention to use IT. However, college students lack the internalization of IT qualities compared to that of knowledge workers. Knowledge workers are mature enough to be less likely to follow others blindly in using IT whereas college students are more likely to be more easily influenced in their IT-using behavior. Therefore:

H3: Social influence will positively influence the intention to use innovative and mature IT only in the non-knowledge group.

Moderators of Social Influence: Knowledge Workers and IT Maturity

When knowledge workers adopt IT environmental and cultural elements tend to exert substantial influence (Sviokla, 1996). Gefen and Straub (2000) contended that the influential factors on intention to use IT can be different according to the usage objective of IT. For instance, PEU is important in using the Internet for the purpose of communication or entertainment whereas PU is important for work (Etille, 1983; Gefen & Straub, 2000). Knowledge workers must consider more of the relevancy to their tasks in making the intention to use IT. Instead of promptly forging use intention they seriously consider the usefulness and relevancy of IT to their tasks and also welcome others' opinions in this regard. Meanwhile, college students are more sensitive to ease-of-use of the IT characteristics and others' opinions in this respect.

WIS is the service that transmits voice, data, and multi-media wirelessly and recently added mobility by mobile Internet technology. In enterprise operations and processes, field-oriented functions such as sales and marketing, logistics, distribution and insurance businesses have been very proactive in adopting this IT. WIS can be regarded as an innovative IT. Social pressure may influence non-users of WIS to believe that they have been left behind (Cheung et al., 2000). Therefore, we develop the following hypotheses specifically in the context of WIS.

H4: Social influence will have a more significant

impact on knowledge workers' PU of innovative IT than upon non-knowledge workers.

H5: Social influence will have a more significant impact on a non-knowledge workers' PEU of innovative IT than upon knowledge workers.

In contrast we used spreadsheets to represent a mature IT. This is was for several reasons. According to the TAM (McFarlan, 1983) there are four levels of IT maturity: 1) technology identification and investment; 2) technology learning and adaptation; 3) rationalization and management control; 4) widespread technology transfer. Knowledge workers have considerable experience with spreadsheets, which means the technology corresponds to the TAM's fourth phase. Perceptions about, as well as diffusion of, spreadsheets is higher than for WIS.

Technology innovation studies insist that technical utility is the major concern in early stages of innovative technology whereas complementary features come afterwards (Anderson & Tushman 1990; Schilling 2005). This argument is actually opposite to that of the TAM where PEU matters first and leads to PU afterwards. We argue that it is naïve to insist that PEU always matters prior to PU in every context because when relevancy to tasks is the major concern, the sequence of priority between PU and PEU can be the reverse to that argued in the TAM. Knowledge workers would put up with uncomfortable or inconvenient IT qualities only if it can enhance task performances. Therefore:

H6: Social influence will have a more significant impact on knowledge workers' PU of immature IT than of mature IT.

H7: Social influence will have a more significant impact on knowledge workers' PEU of mature IT than immature IT.

Research Method

Data Collection

In order to measure self-awareness as knowledge workers we developed the following four measurement items and asked for workers' self-perception: 1) "I am free from any interference in making decisions in my job"; 2) "I have my own methodology or specific knowledge to solve problems related to my work"; 3) "I perform more cognitive and mental work than physical work"; 4) "My productivity makes a large contribution to my organization's competitive advantage." We included only the samples as knowledge workers whose scores were beyond the average. Knowledge workers and college students were asked to fill out spreadsheet and WIS surveys by paper-based surveys anonymously and to submit them to the researchers. It took 16 weeks to collect survey (October, 2003 ~ February, 2004).

The target population was any organization across various industries using WIS at work in Korea. We first consulted the list of the Korea Information Society Development Institute and IT Research and Consulting referencing on "A white book on IT" published in 2004.

These two organizations survey annual IT investment and usage of enterprises listed on the Korean Stock Exchange. It shows that WIS is dominantly used in sales and logistics departments. We randomly selected 100 firms from these five industries listed on the Korean Stock Exchange. We distributed questionnaires to 250 of their employees in sales and logistics departments by e-mail. We received 162 responses from 42 firms (a response rate of 64.8%). We eliminated 9 responses that had below average scores in four questions related to knowledge workers' self-perception on the degree of their work expertise, leaving 153 for statistical analysis. Of these 31.2% were in telecommunications, 22.1% in finance/insurance, 16.9% in logistics, 11.7% in manufacturing, 9.8% in mobile, and 8.3% in others.

Next we decided to treat college students as non-knowledge workers and surveyed Yonsei and Ewha Womans University in Seoul, South Korea. The faculty explained the purpose of the study and gave instructions on how to fill out the printed questionnaire in their class. Some 197 questionnaires were returned out of the 250 sample. Most of students were majoring in MIS, engineering and other computer-related disciplines. The students had already taken, or were taking, courses related to computers, database, and programming languages, and were quite familiar with WIS.

Questionnaires

Most of the measurement items relating to social influence were taken from relevant studies. First, we referred to Shaw (1980), Brass (1984) and Rice and Aydin (1991) regarding criteria of the referent for the subjective norm. Measurement items of visibility, image and voluntariness came from Moore and Benbasat (1991). The measurement items of PU, PEU and intention to use were taken from Venkatesh and Davis (2000). For each question respondents were asked to indicate the extent of their agreement on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

Results

In testing our hypotheses four different models were run by PLS-Graph (version 3.0) and compared: two models (WIS and spreadsheet) of knowledge workers and students. In order to ensure that the referent is indeed the person who has power and specific status we included only the surveys whose average scores for the five questions on the referent in a questionnaire exceed 2.5 (the median of the 5 point scale). Finally, 23 invalid cases were excluded from the knowledge worker samples, so 130 valid questionnaires were analyzed. In the student samples 183 valid questionnaires out of the 197 submitted were used.

Test of Measurement Model

We test the measurement model for each sample (knowledge workers and college students) separately by

examining internal consistency, convergent validity, and discriminant validity. Internal consistency is examined using the composite scale reliability index developed by Fornell and Larcker (1981), which is similar to Cronbach's alpha. Fornell and Larcker recommend using a criterion cut-off of .7 or .6. An examination of internal consistency shows that all items in both groups satisfy this criterion.

We assess convergent validity by examining the loadings of the measures on their corresponding construct. In our case the estimates of loadings for our four indicators are the regression weights. A rule of thumb is to accept items with regression weights of .7 or more (Barclay et al., 1995). However, it is also important to retain as many original items as possible to preserve the original research design and to compare the results with other studies that used the same scales. Six items in the knowledge worker group model show weights below 0.7. However, such low weights may also be the result of the small sample size (Barclay et al., 1995; Yoo & Alavi, 2001). Because these items exhibited the acceptable factor loading scores in the other studies we include these six items.

In PLS the discriminant validity of items is assessed by criteria similar to multi-trait/multi-method analysis (Barclay et al., 1995). For adequate discriminant validity the diagonals should be greater than the off-diagonals in the corresponding rows and columns and exceed .5 (Chin, 1998). Another criterion for discriminant validity is that no measurement item should load more highly on other constructs than the construct it intends to measure. An examination of factor and cross-factor loadings shows that all the items satisfy this criterion for both samples except voluntariness. Finally, voluntariness was dropped.

Test of Structural Model

To assess the statistical significance of the path coefficients, a bootstrap analysis was used (Chin, 1998). Our results provide support for social influence on user beliefs on PU and PEU. For both groups we hypothesized that social influence would have a positive impact on PU and PEU of both knowledge and non-knowledge groups (H1 and H2). The results of the PLS analysis show that social influence significantly affects PU and PEU in both groups. The direct path from social influence to intention to use is significant only for students (H3). As such, H1, H2 and H3 are supported.

We also hypothesized that social influence affects knowledge workers' PU more strongly than that of students in regards to innovative IT, whereas PEU demonstrates the opposite situation. To test these hypotheses we conducted two unpaired t-tests as the method of Keil et al. (2000). Results showed that the path coefficient from social influence to PU for WIS in the structural model for knowledge workers was significantly stronger than the corresponding path coefficient in the structural model for university students, supporting H4 ($t = 31.96, p < 0.01$). Also, as hypothesized, social influence of knowledge workers on PEU yielded a significantly stronger inverse relationship. The paths from social influence to PEU

demonstrated that the path coefficient from social influence to PEU of WIS ($t=-13.228$, $p<.001$) for college students was significantly stronger than the corresponding path coefficient for knowledge workers. Social influence has a more profound influence on college students' PEU than as knowledge workers', supporting H5.

Moreover, to examine whether the effects of social influence on knowledge workers' beliefs is moderated by IT maturity we conducted another round of unpaired t-tests. Our results support H6. Social influence has a more significant impact on the PU of WIS than spreadsheets for knowledge workers ($t=21.237$, $p<0.01$). Hence, social influence of knowledge workers on PEU yielded a significantly stronger inverse relationship. Social influence has a more profound influence on knowledge workers' PEU about mature IT ($t=-21.187$, $p<.001$) than innovative IT, supporting H7.

Discussion

This study investigated the process of how users (especially knowledge workers) are influenced by others (not necessarily by system functions) in innovative IT adoption. We found that knowledge workers care about others' opinions on usefulness of innovative IT. This finding suggests that new IT service providers need to develop and make good reference to socially influential people and ask them to endorse the usefulness of such innovative IT. Academically, we cautioned scholars not to take the binary posture about social influence: i.e., does it matter or not. Instead, we argue that social influence works in certain cases and identify when it does matter. People cannot avoid other's attitudes and opinions on their own decisions because we voluntarily look for references, especially when we are faced with uncertainties. IT service providers should be concerned about general perceptions and opinions coming from user experiences as well as the improvements in functions. However, people (especially knowledge workers) do not listen to all of the others' voices. Identifying what are the sensitive opinions is the key to take good advantage of people's psychology to allude to social influence in their decision-making. In short, our research provides useful insights implications for audiences that are more academic (theoretical developments and empirical data) and practical (for a range of groups, from workers to their employers and IT developers and providers).

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