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Research Report

Relating motivation to information and communication technology acceptance: Self-determination theory perspective

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ABSTRACT

Despite a large body of research on motivation in psychology, few in information systems have related it to the information and communication technology acceptance research. This study investigates the relation between the Self-Determination Theory of Motivation and the Unified Theory of Acceptance and Use of Technology (UTAUT) Model and confirms significant relationship across the two theories. In addition, this study investigates the effect of time sequential introduction of different types of motivation and finds the presence of the negative effect between intrinsic and extrinsic motivation is conditional on the type of extrinsic motivation. *Controlled extrinsic motivation* undermines intrinsic motivation that precedes it, but *autonomous extrinsic motivation* augments such intrinsic motivation. Implications of these findings are discussed.

1. Introduction

Information and communication technology (ICT) has become a pivotal part of the daily work of knowledge workers (Arsal, Thatcher, Zagenczyk, McKnight, & Ahuja, 2009; Bloom, Garicano, Sadun, & Van Reenen, 2014). Since 1980s, about 50% of capital investment in organizations has been in ICT (Spiezia, 2013). However, despite the expectation of productivity gain and enhanced competitiveness through ICT, user acceptance of ICT in the workplace has been by no means universal (Hwang & Lee, 2012; López-Nicolás, Molina-Castillo, & Bouwman, 2008).

Theories of motivation could provide an important perspective from which to study ICT acceptance behavior as they could help us answer questions such as *What are the factors motivating the use of technology?* and *How do different types of motivation interact with each other?* Large bodies of motivational research exist in many disciplines including psychology (Deci & Ryan, 2000; Ryan, Huta, & Deci, 2013), economics (Festré & Garrouste, 2014), marketing (Kim, Park, & Oh, 2008; Muk & Chung, 2015), and management (Osterloh & Frey, 2000; Reinholt, Pedersen, & Foss, 2011). Yet the relationship between a motivation theory and ICT acceptance behavior has not been studied much with some exceptions (Hung, Durcikova, Lai, & Lin, 2011; Shim, Chae, & Lee, 2009; Venkatesh & Speier, 2000). Investigating motivational factors and their influences are crucial since they can be directly implemented into applications to increase their usage.

This study has two research objectives. The first is to examine the motivational determinants of two major ICT acceptance variables such as *Performance Expectancy* and *Perceived Enjoyment* based on self-determination theory (Deci & Ryan, 1985). Typically in the ICT acceptance studies that examine the motivational aspect, *Performance Expectancy* has served as a surrogate construct for extrinsic motivation and *Perceived Enjoyment* as that for intrinsic motivation. However, there was little attempt to relate these constructs to the constructs of a specific motivation theory. Therefore, how motivation affects these surrogate constructs is yet to be investigated. Based on self-determination theory, a major theory in motivation research, suggesting three determinants of human motivation – *Autonomy*, *Relatedness*, and *Competence* (Vallerand, Fortier, & Guay, 1997), we investigate the relationship between these determinants and the ICT acceptance constructs.

The second objective of this study is to investigate the effect of sequential introduction of different types of motivation in order to gain a deeper understanding of the relationship between human

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motivation and technology acceptance. In previous ICT acceptance studies on intrinsic/extrinsic motivation, the sequential effect of the intrinsic and extrinsic motivation was never explicitly studied. However, there is substantial evidence from the psychological experiments performed by Deci and his colleagues (Deci, Koestner, & Ryan, 1999) showing the negative effect of extrinsic motivation on intrinsic motivation preceding it. Therefore, this study examines the potentially undermining effect of extrinsic motivation on intrinsic motivation in the ICT acceptance context when they are sequentially introduced. Furthermore, we examined the effect by dividing extrinsic motivation into autonomous and controlled extrinsic motivation, which has been speculated to provide different effects to intrinsic motivation (Vallerand, 1997).

2. Research background

Motivation theory is widely applied in psychology to explain human behavior. One of the main distinctions that motivational researchers make is between intrinsic and extrinsic motivation (Deci & Ryan, 1985). Intrinsic motivation is a drive that "deals with behavior performed for itself, in order to experience pleasure and satisfaction inherent in the activity" (Vallerand, 1997, p. 271), Increased intrinsic motivation is related to an individual's willingness to spend more time on a task, creates an affective mood, results in effective learning, and leads to a certain behavior (Ho & Kuo, 2010; Hung et al., 2011; Parayitam, Desai, Desai, & Eason, 2010). On the other hand, extrinsic motivation is a drive that "involves performing behavior in order to achieve some separable goals, such as receiving rewards or avoiding punishment" (Vallerand, 1997, p. 271). Extrinsic motivation has been known to enhance performance and productivity (Ryan & Deci, 2000b). During the past three decades, over 800 studies have been performed on the effects of intrinsic and extrinsic motivation on behavior (Deci et al., 1999). Many of these studies have been based on and led to the refinement of the self-determination theory.

2.1. Self-determination theory

Self-determination theory (Ryan & Deci, 2000a, 2000b) assumes that "humans have the basic propensities to be intrinsically motivated, to assimilate their social and physical worlds, to integrate external regulations into self-regulations, and, in so doing, integrate themselves into a larger social whole" (Ryan & Deci, 2000b, p. 14). The theory consists of two sub-theories: Cognitive evaluation theory and organismic integration theory. Cognitive evaluation theory investigates the driving factors of human behavioral motivation and the conditions that undermine or elicit intrinsic motivation, while organismic integration theory examines different types of extrinsic motivation and conditions that promote or hinder extrinsic motivation.

2.1.1. Cognitive evaluation theory

Cognitive evaluation theory (Deci & Ryan, 1985) specifies factors that affect variability in motivation and explains the undermining effects of extrinsic motivation on intrinsic motivation. The theory proposes that the needs for *Autonomy*, *Relatedness*, and *Competence* are three facilitators of human motivation. Vallerand (1997) defined the three facilitators as follows:

The need for *Competence* implies that individuals have a desire to interact effectively with the environment in order to experience a sense of *Competence* in producing desired outcomes and preventing undesired events. The need for *Autonomy* reflects a desire to engage in activities of one's own choosing, to be the origin of one's own behavior. Finally, the need for *Relatedness* involves feeling connected (or feeling that one belongs in a given social milieu) (Vallerand, 1997, p.300).

The effects of these factors have been verified through previous experimental and field studies. For example, Akbari, Pilot, and Simons (2015) found that the effects of *Competence* enhanced intrinsic motivation and extrinsic motivation. Custers, Westerhof, Kuin, Gerritsen, and Riksen-Walraven (2012) found a positive relation between *Relatedness* and intrinsic motivation. *Autonomy*'s significant positive effects to intrinsic motivation are also addressed through several studies (Brophy, 2004; Ryan & Deci, 2000a).

Deci and his colleagues (Deci & Ryan, 1985; Ryan & Deci, 2000a, 2000b) also found a negative effect of extrinsic motivation on intrinsic motivation when extrinsic motivation is introduced for a task that is intrinsically motivating. For example, when experimental subjects received rewards, such as money or prizes for participating in an interesting activity (e.g., completing puzzles or drawing), they tended to lose interest in the activity and were less willing to work on it after the extrinsic rewards were terminated. This result is supported by cognitive evaluation theory, which asserts that when a person comes to perceive his/her behavior as controlled by external motivation, it will lead to a decrease in intrinsic motivation. That is, the provision of an extrinsic motivation drives a shift in locus of causality for the original task from internal to external (Chen & Jang, 2010; Deci & Ryan, 1985). This undermining effect has been supported by several meta-analyses (e.g., Deci et al., 1999).

2.1.2. Organismic integration theory

Based on the proposition that extrinsic motivation can vary in its relative autonomy (Vallerand, 1997), organismic integration theory identifies and defines different forms of extrinsic motivation, and addresses the contextual factors that either promote or hinder internalization and integration of the regulation for those behaviors (Ryan & Deci, 2000a). Vallerand (1997) classifies and proposes four types of extrinsic motivation: *external, introjected, identified*, and *integrated regulation*. The *external regulation* and *introjected regulation* are called a controlled motivation composite, and *identified regulation* and *integrated regulation* are called an autonomous motivation composite. Each extrinsic motivation is defined as follows:

External regulation refers to the behavior for which the locus of causality is external to the person, for example, the offer of rewards... *Introjected regulation* refers to behavior that taking in a regulation but not fully accepting it as one's own, for example, promised rewards... *Identified regulation* occurs when the person has come to value the behavior and has identified with and accepted the regulatory process, and thus it becomes fully a part of the self.... *Integrated regulation* involves emitting an activity choicefully, and fully integrating it with the individual's coherent sense of self such as values, needs, and identities (Deci & Ryan, 1991, pp. 328–330).

These different types of extrinsic motivation have been known to have distinct effects on intrinsic motivation. In particular, previous studies (Ryan & Deci, 2000b) have found that: when the extrinsic motivation is perceived as a controlling aspect (*external* and *introjected regulation*), it undermines intrinsic motivation. On the other hand, when the extrinsic motivation is perceived as an autonomous aspect (*identified* and *integrated regulation*), it has been found to enhance the intrinsic motivation. The theory proposes that the controlling aspect of extrinsic motivation stimulates external perception of locus of causality (i.e., the sense that the behavior stems from a source outside the self (Ryan & Deci, 2000b), while the autonomous aspect of extrinsic motivation stimulates the internal perception of locus of causality (i.e., the sense that the behavior stems from sources inside the self).

2.2. ICT acceptance theories

During the past 20 years, the IS community has put considerable attention on the ICT acceptance theories including the social cognitive theory (Compeau, Higgins, & Huff, 1999; Polites & Karahanna, 2013), technology acceptance model (Davis, 1989), theory of reasoned actions/planned behavior (Nasri & Charfeddine, 2012; Szajna, 1996), Triandis Model (Thompson, Higgins, & Howell, 1991), unified theory of acceptance and use of technology (Martins, Oliveiraa, & Popovic, 2014; Venkatesh, Morris, Davis, & Davis, 2003). These models have been applied to different technologies (e.g., word processors, e-mail, World Wide Web, group support systems, hospital information systems) under different situations (e.g., time and culture) with different control factors (e.g., gender, organizational type and size) and with different subjects (e.g., undergraduate students, MBA recipients, and knowledge workers), proving their robustness through several tests and replications. Researchers in the IS field continue to devoting their effort on developing a dominant theory addressing the ICT acceptance. In the majority of past ICT acceptance studies on motivation, *Performance Expectancy* and *Perceived Enjoyment* were viewed as surrogate constructs of extrinsic and intrinsic motivation (Maiano, Therme, & Mestre, 2011; Venkatesh et al., 2003; Zaman, Anandarajan, & Dai, 2010). *Performance Expectancy* captures extrinsic motivation, because it measures the extent to which one uses technology "in order to achieve some separable goals" (Vallerand, 1997, p.271), namely "to attain gains in job performance" (Venkatesh et al., 2003, p. 447). That is, *Performance Expectancy* captures the part of motivation underlying technology use for the goal that is not inherently enjoyable or is not immediately tied (though indirectly tied) to the use of the technology. On the other hand, *Perceived Enjoyment* captures intrinsic motivation because it measures the extent to which the activity of using the ICT is perceived to be pleasant in its own right, distant from any performance consequences that may be projected. Thus, it presumably measures the extent to which one performs behavior for oneself in order to experience pleasure and satisfaction inherent in the activity (Deci & Ryan, 2000).

3. Hypotheses

This study examines the following two research questions: (1) If technology use is driven by motivation, how are human motivational determinants such as *Autonomy*, *Relatedness*, and *Competence*, related to the ICT acceptance constructs, such as *Performance Expectancy* and *Perceived Enjoyment*? (2) To what extent do the findings in motivational theory carry over to ICT use behavior? In particular, does the undermining effect of extrinsic motivation on intrinsic motivation, discussed above, hold in the context of ICT use?

As discussed in the previous section, the cognitive evaluation theory proposes three determinants for human motivation: *Autonomy*, *Relatedness*, and *Competence*. All three are inner facilitators of human motivation: individuals' desire to interact with the environment effectively (*Competence*), to engage in activities of one's own choice (*Autonomy*), and to feel connected (*Relatedness*). Therefore, we believe that when a person perceives that the adoption of a technology provides more control to conduct interesting tasks (e.g., more influence, more knowledge, and more resources), provides a closer relationship with other colleagues or communication partners, and makes him/her feel competent to perform the tasks, he/she will be more intrinsically motivated to use the technology. In particular, we hypothesize that there would be a significant positive relationship between these constructs and *Perceived Enjoyment*, which we posit to be a construct capturing most, if not all, of intrinsic motivation.

The relation between these motivational determinants and *Performance Expectancy*, however, is less clear. There exist few prior studies that provide us with a basis for positing a kind of relationship between them or between the determinants and external motivation. In the absence of a theoretical basis, we could have opted either not to examine this relationship or to formulate a hypothesis to test based on our intuition. We chose the latter, because we wanted to know whether there is any relationship between them and, if so, what kind, even when we may not have a good explanation yet. That way, at least we would have a data point that needs to be explained further if the current explanation is not adequate.

We note that this assumed relationship does not say anything about any increase in the actual usefulness but only about *Performance Expectancy*. We are merely assuming that when the use of a technology makes one intrinsically motivated, one is more likely to perceive it to be more useful analogous to the halo effect in social psychology, where one's impression of overall traits of another person is influenced by the knowledge of one or few traits of that person's. Therefore, we hypothesize a positive relationship between these determinants and *Performance Expectancy*.

H1. *Autonomy, Relatedness* and *Competence* significantly influence *Perceived Enjoyment* and *Performance Expectancy*.

H1a–c. *Autonomy, Relatedness,* and *Competence* significantly and positively influence *Perceived Enjoyment*.

H1d–f. *Autonomy, Relatedness*, and *Competence* significantly influence *Performance Expectancy*.

Additionally, although not a major focus, the study also replicates, in the context of knowledge sharing systems, the consistent and powerful relationships among ICT acceptance major variables (Joo, Joung, & Sim, 2011; Lin & Hwang, 2014; Saeed & Abdinnour-Helm, 2008; Sung & Mayer, 2012; Yoo, Han, & Huang, 2012) that have been confirmed through the extensive ICT acceptance studies. Therefore, we test for the following relationships: (i) *Performance Expectancy–Use Intention*, (ii) *Perceived Enjoyment–Use Intention*, (iii) *Effort Expectancy–Perceived Enjoyment*, (iv) *Effort Expectancy–Performance Expectancy*, (v) *Effort Expectancy–Use Intention*, and (vi) *Use Intention–Actual Use*. We hypothesize:

H2. There are significant relationships between ICT acceptance major variables.

H2a. *Performance Expectancy* significantly influences *Use Intention.*

H2b. *Perceived Enjoyment* significantly influences *Use Intention.*

H2c. *Effort Expectancy* significantly influences *Perceived Enjoyment.*

H2d. *Effort Expectancy* significantly influences *Performance Expectancy*.

H2e. *Effort Expectancy* significantly influences *Use Intention.*

H2f. *Use Intention* significantly influences *Actual Use*.

In addition, this study tests the potential effect of extrinsic motivation on intrinsic motivation in the context of Qboard use. Many studies (e.g., Deci et al., 1999) indicate that when extrinsic motivation is introduced for a task in which people are interested in intrinsically already, the intrinsic motivation is often undermined. For example, Deci et al. (1999) cite over 100 previous studies that report such significant undermining effects.

Meanwhile, although Davis, Bagozzi, and Warshaw (1992) originally dismissed this effect on the ground that the technology use then was not intrinsically motivating in the first place, there are now reasons to reexamine this effect. First, with the increasing presence of more user-friendly applications such as the WWW and multimedia presentations, many technology use situations may have become more intrinsically motivating. Second, the sequential introduction of different types of motivation is often observable in daily work environment. Many organizations have focused on how to draw employees' interest when they introduce new technologies. For example, after the trial periods (during which employees may be intrinsically motivated through curiosity, playfulness, or self-efficacy), they often introduce extrinsic motivation (e.g., promotion, evaluation, and awards) to increase the usage of the newly introduced technology.

We also note more recent discussions on the validity and the scope of the undermining effect of extrinsic on intrinsic motivation (Eisenberger, Pierce, & Cameron, 1999) and a proposal (Deci & Ryan, 2000) that the negative effect is contingent upon the types of extrinsic motivation. The proposal argues that the undermining effect is observable only when intrinsic motivation is followed by the introduction of *controlled extrinsic motivation* (e.g. monetary awards) but not the introduction of *autonomous extrinsic motivation* (e.g., reputation), which would rather enhance not undermine the intrinsic motivation.

To illustrate these different types of extrinsic motivation, consider the following case of technology use. One may be initially intrinsically motivated to use Qboard (e.g. curiosity, fun). On the other hand, one might be motivated *extrinsically and autonomously* if one enjoy using the discussion board to share information because s/he enjoys the recognition among Qboard users. In this case, the Qboard use is driven by extrinsic motivation (i.e., posting her/his name into hall of fame to be popular between classmates), but this desire has been "identified" or "internalized", inducing the sense that the behavior stems from sources inside the self (i.e. internal locus of causality). As such, the activity, even though it is still a means somewhat removed from the goal, becomes enjoyable itself. In this case, the initial intrinsic motivation would be augmented by this autonomous extrinsic motivation. Or the Qboard use might be driven by controlled extrinsic motivation, whose value comes from external locus of control. For example, one might enjoy Qboard use to take a chance to get awards announced (football tickets, gift certificates). In this case, when the possibility of receiving awards disappears, the initial intrinsic motivation is diminished since her/his locus of control has been moved externally and it is difficult to move it back inside.

Therefore, we hypothesize that intrinsic motivation to Qboard use would be undermined when controlled extrinsic motivation is introduced but not when autonomous extrinsic motivation is introduced.

H3. When a task is intrinsically motivated and then extrinsically motivated, the extrinsic motivation interacts with the intrinsic motivation.

H3a. When a task is intrinsically motivated and then extrinsically motivated with autonomous extrinsic motivation, the extrinsic motivation augments the intrinsic motivation.

H3b. When a task is intrinsically motivated and then extrinsically motivated with controlled extrinsic motivation, the extrinsic motivation undermines the intrinsic motivation.

4. Research methods

To test the research hypotheses, two field studies were conducted. Study 1 examined the relationship between three motivational determinants and the major ICT acceptance constructs. Study 2 examined whether extrinsic motivation, when introduced for a task that was intrinsically motivating, has a negative effect on the intrinsic motivation. This effect was tested with two different types of extrinsic motivation: autonomous and controlled.

4.1. Study 1: The relationship between motivation and ICT acceptance

4.1.1. Study1: Research design

Study 1 was conducted with 324 business undergraduate students at a large Midwestern university. The target system was an online knowledge sharing system called the Qboard, which is a Web-based threaded discussion board that allows users to communicate and share information through posting and answering messages. Nowadays, similar systems are widely used in organizational, educational, or Internet environments. For example, online class support systems such as Blackboard and Canvas, idea sharing systems such as IdeaStorm and my Starbucks idea, customer review systems such as Yelp, and other Q/A sites such as UClue and StackExchange. These systems offer different sets of extrinsic and intrinsic motivation and have been successful to different degrees.

We introduced the Qboard at the beginning of the semester and asked the subjects to visit the board during the first two weeks. We then introduced different types of motivations in the next three weeks in random order. To induce intrinsic motivation, we posted links to sites hosting online games, music, and jokes. To induce autonomous extrinsic motivation, we posted sample practice questions and also used a "Hall of Fame," which identified those who posted the most useful and interesting message. Finally, to induce controlled extrinsic motivation, we advertised and awarded gift certificates and football tickets for using the Qboard.

We believe that these efforts will successfully induce the intrinsic, autonomous extrinsic, and controlled extrinsic motivations as defined earlier. We have found that students are willing to use the Qboard for visiting jokes and online games sites without any other motivations (i.e., intrinsic motivation). On the other hand, the motivations for using the Qboard for the Hall of Fame or for sample quiz questions are external (e.g., doing well on the quiz or gaining the esteem among the other students). However, for those who do use the Qboard for these goals, these goals seem to have been internalized so that the locus of control is within rather than without (Ryan & Deci, 2000c). In the cases where the Qboard is used for football tickets or gift certificates, the incentives are external and little related to the task of using the Qboard so that its use would be driven by controlled extrinsic motivation.

To verify if study participants differentially perceive the motivations, a manipulation check with 35 business undergraduate students at the same institution was conducted. After reading the definition of intrinsic and extrinsic motivation, they were asked to answer a questionnaire, which includes questions about how much each medium for inducing motivations is perceived to be related to intrinsic or extrinsic motivation. Nine-point Likert-like scales were used, with a 1 meaning extremely intrinsic and a 9 meaning extremely extrinsic). The results of a *t*-test confirmed our intuitions indicating that students clearly distinguish each medium as a different incentive.

Table 1 shows post hoc test (Tukey) results of mean difference. Overall, the main effect of seven incentives was found to be significantly different ($F_{6,1}$ = 169.641, p < 0.001). However, there were no significant differences within intrinsic incentives (i.e., games, music, and jokes), and within autonomous extrinsic incentives (i.e., sample quiz/exam questions and hall of fame), and within controlled extrinsic incentives (i.e., football tickets and gift certificates).

We additionally investigated three characteristics of perceived locus of causality which perceptually differentiate autonomous extrinsic motivation (sample practice question and Hall of Fame) from controlled extrinsic motivation (football tickets and gift certificates). They are External (1)....Internal (7), Compliance (1).... Congruence (7), and Rewards (1).... Self Awareness (7).

As a result, it was found that subjects clearly distinguish each incentive for all characteristics. For external/internal characteristics, sample practice questions, and Hall of Fame were considered as relatively internal (mean = 5.8, s.d. = 1.42), meanwhile football tickets and gift certificates were considered as relatively external (mean = 2.3, s.d. = 0.67). Their difference was statistically significant (t = 3.05, p < 0.01). The results for other characteristics also confirmed that subjects successfully distinguish autonomous extrinsic from controlled extrinsic motivation (compliance/congruence: t = 2.97, p < 0.01; rewards/self awareness: t = 3.78, p < 0.001). In summary, the manipulation check addressed that people can successfully distinguish each type of motivation[3].

4.1.2. Study1: Measurement

Our instrument development processes consisted of three phases: (1) initial instrument development, (2) pretest, and (3) pilot test. First, we developed an initial instrument for the survey based on the previous studies. The standard instruments from the ICT acceptance studies and the self-determination theory studies were chosen and modified for the technology acceptance context. *Performance Expectancy* (4 items), *Effort Expectancy* (4 items), *Use Intention* (2 items), and *Usage* (2 items) were measured using scales of (Venkatesh et al., 2003) and *Perceived Enjoyment* (4 items) of Davis (1989). The measurement items of *Autonomy* (4 items), *Relatedness* (3 items), and *Competence* (3 items) were developed based on scales of Vallerand (1997). The measurement instruments were reviewed by six experts in management, psychology, and the IS field who are familiar with the ICT acceptance and motivation theory. The wording, item order, content, and format of the questionnaire were examined and modified by the suggestions of the experts.

Second, we performed a pretest with 11 experts, including six faculty members and five business and psychology doctoral students. In addition to their responses to the questionnaire, we also asked for their input on the questionnaire's wording, item order, content, and format through unstructured interviews with each participant. All of the suggestions were reflected in the revised questionnaire. Finally, with the revised questionnaire, we performed a pilot test with 24 MBA students at a Midwest university. We administered the same procedure to the participants in the pretest and revised the questionnaire again based on their input. Final measurement instruments are listed in Table 2.

4.1.3. Study 1: Results

LISREL (Joreskog & Sorbom, 1993) was used to perform a confirmatory factor analysis for investigating psychometric properties of measurement instruments and to perform a path analysis for examining the nomological networks between constructs.

[3] We further examined gender differences in intrinsic and extrinsic motivations and did not find statistically significant differences.

4.1.3.1. Analysis of the measurement model.

The psychometric properties of the measurement model were examined first. To measure goodness of fit, we used the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), and root mean square residual (RMR). All of the statistics showed a good fit (GFI = 0.92, AGFI = 0.89, NFI = 0.96, NNFI = 0.98, CFI = 0.98, RMR = 0.024, and RMSEA = 0.038) (Hair, Anderson, Tatham, & Black, 1998).

Convergent validity was evaluated using three criteria suggested by Fornell and Larcker (1981). (1) All indicator factor loadings (λ) should be significant at p < 0.05 and exceed 0.7; (2) composite reliabilities should exceed 0.8; and (3) average variance extracted (AVE) by each construct should exceed the variance due to measurement error for that construct. All factor loadings in the CFA model exceeded 0.7 and were significant at p = 0.05. Composite reliabilities ranged between 0.82 and 0.95 (see Table 3). AVE ranged from 0.70 to 0.91, greater than variance due to measurement error. Therefore, all three conditions for convergent validity were met.

In addition, *discriminant validity* was assessed by constraining the estimated correlation parameters (ϕ_{ij}) between constructs to 1.0 and then performing a chi-square difference test on the values obtained for the constrained and unconstrained (Anderson & Gerbing, 1988; Segars & Grover, 1993). All chi-square differences between constrained and unconstrained (smallest χ^2 difference/d.f = 97.02) were significant at p < 0.01, showing clear discriminant validity among these constructs. The Cronbach α scores of all constructs were over 0.82, showing high *reliability* of items used for each construct.

4.1.3.2. Analysis of the structural equation model.

As shown in Fig. 1, most standardized path coefficients were significant as hypothesized. Solid lines represent significant paths and dashed lines insignificant paths. The t-values showed that most hypotheses, except H1f (*Competence–Perceived Enjoyment*) and H3c (*Effort Expectancy–Performance Expectancy*), were significant at the 0.05 level.

Autonomy (γ = .33, p < 0.001) and *Relatedness* (γ = .45, p < 0.001) were significant determinants of *Perceived Enjoyment*, while *Competence* (γ = .07, p < 0.001) was not. The results indicated that the more users perceived control in their class and closer relationships with others by using Qboard, the more they enjoyed using the technology. The insignificance of *Competence* is puzzling, but we attribute it to the possible absence of challenge in the use of this type of technology for the current subjects, as we elaborate more in the discussion section. *Autonomy* (γ = .18, p < 0.001), *Relatedness* (γ = .27, p < 0.001), and *Competence* (γ = .43, p < 0.001) significantly influenced *Performance Expectancy*. Especially, *Competence* was the most significant factor affecting *Performance Expectancy*.

Most relationships between the ICT acceptance constructs were significant, except the relationship between *Effort Expectancy* and *Performance Expectancy*, consistent with previous results during the initial use of the technology (Venkatesh et al., 2003). Since the participants of this study experienced Qboard for only a few weeks, it was too early to develop the perception of the relationship between *Effort Expectancy* and *Performance Expectancy*. However, the significant influence (γ = .15, p < 0.01) of *Effort Expectancy* to *Perceived Enjoyment* indicates that ease of use of Qboard positively influences users' perception of enjoyment. *Use Intention* was found to be a surrogated measure of *actual usage* (γ = .82, p < 0.001). Finally, all the R^2 values were high, showing that the determinants of *Actual Use* (R^2 = .68), *Use Intention* (R^2 = .89), *Performance Expectancy* (R^2 = .75) and *Perceived Enjoyment* (R^2 = .85) successfully explain their large amounts of variances. Both *Performance Expectancy* (γ = .46, p < 0.001), and

Table 1
PostHoc analysis results of a manipulation check.

Variable	Variable	Mean difference	Sig.	Variable	Variable	Mean difference	Sig.
1.00 (games)	2.00	.4000	.711	5.00 (hall of fame)	1.00	2.6286 (*)	.000
	3.00	.3714	.778		2.00	3.0286 (*)	.000
	4.00	−2.3714 (*)	.000		3.00	3.0000 (*)	.000
	5.00	−2.6286 (*)	.000		4.00	.2571	.954
	6.00	−4.7143 (*)	.000		6.00	−2.0857 (*)	.000
	7.00	−5.2286 (*)	.000		7.00	−2.6000 (*)	.000
2.00 (music)	1.00	−.4000	.711	6.00 (football tickets)	1.00	4.7143 (*)	.000
	3.00	−.0286	1.000		2.00	5.1143 (*)	.000
	4.00	−2.7714 (*)	.000		3.00	5.0857 (*)	.000
	5.00	−3.0286 (*)	.000		4.00	2.3429 (*)	.000
	6.00	−5.1143 (*)	.000		5.00	2.0857 (*)	.000
	7.00	−5.6286 (*)	.000		7.00	−.5143	.418
3.00 (jokes)	1.00	−.3714	.778	7.00 (gift certificates)	1.00	5.2286 (*)	.000
	2.00	.0286	1.000		2.00	5.6286 (*)	.000
	4.00	−2.7429 (*)	.000		3.00	5.6000 (*)	.000
	5.00	−3.0000 (*)	.000		4.00	2.8571 (*)	.000
	6.00	−5.0857 (*)	.000		5.00	2.6000 (*)	.000
	7.00	−5.6000 (*)	.000		6.00	.5143	.418
4.00 (sample practice question)	1.00	2.3714 (*)	.000				
	2.00	2.7714 (*)	.000				
	3.00	2.7429 (*)	.000				
	5.00	−.2571	.954				
	6.00	−2.3429 (*)	.000				
	7.00	−2.8571 (*)	.000				

* $p < .001$.

Table 2
Measurement instruments.

Constructs	References	Coding	Items
Usage	Davis (1989)	USE1	Self-reported frequency of use
		USE2	Computer-logged frequency of use
Use intention	Venkatesh, Morris, Davis, and Davis (2003)	UI1	Assuming I have access to the Qboard, I intend to use it
		UI2	Given that I have access to the Qboard, I predict that I would use it
Performance expectancy	Venkatesh, Morris, Davis, and Davis (2003)	PEXP1	Using the Qboard improves my coursework performance
		PEXP2	Using the Qboard increases my productivity for my coursework
		PEXP3	Using the Qboard enhances my effectiveness in my coursework
		PEXP4	I find the Qboard to be useful in my coursework
Effort expectancy	Venkatesh, Morris, Davis, and Davis (2003)	EE1	My interaction with the Qboard is clear and understandable
		EE2	Interaction with the Qboard does not require a lot of my mental effort
		EE3	I find the Qboard to be easy to use
		EE4	It is easy to use the Qboard to do what I want
Perceived enjoyment	Venkatesh, Morris, Davis, and Davis (2003)	PE1	Using the Qboard is enjoyable
		PE2	I have fun while using it
		PE3	I experienced excitement while using the Qboard
		PE4	The actual process of using the Qboard is pleasant
Autonomy	Vallerand (1997)	AUT1	I would have more control in my coursework while using the Qboard
		AUT2	The Qboard gives me more chances to control in my class
		AUT3	The Qboard provides me more opportunities to control myself in the class
Relatedness	(Vallerand, 1997)	REL1	The Qboard gives me more chances to interact with others.
		REL2	I feel close to others while using the Qboard.
		REL3	I have more opportunity to be close to others while using the Qboard.
Competence	Vallerand (1997)	COM1	I am better than others in using the Qboard
		COM2	I have stronger capability than others in using the Qboard
		COM3	I am superior than others in using the Qboard

Perceived Enjoyment ($\gamma = .45$, $p < 0.001$), significantly affected Qboard *Use Intention*, indicating that both are equally important factors positively affecting the *Use Intention*.

4.2. Study 2: The time sequential introduction of extrinsic and intrinsic motivation

4.2.1. Study 2: Research design

To investigate the negative effect between intrinsic and extrinsic motivation, business major students ($n = 191$) who were taking IS courses at a large Midwestern university participated in the study over 10 weeks. Two groups of subjects (G1 = 61, G2 = 68) were assigned to the experimental group, while one group of subjects (G3 = 62) was assigned to the control group. *T*-tests for group differences confirmed that there were no significant differences among the three groups in terms of sample size, computer experience, gender, and knowledge sharing system experience. The subjects in these groups answered the questionnaire four times at the end of each time period ($t1$–$t4$) as shown in Fig. 2.

All the students in two IS courses initially agreed to use Qboard. The participants did not know the research purpose during the participation, and they had no prior experience with this system. The

Table 3
Factor loadings and validity statistics.

	Items	Loadings	*t*-Value	Cronbach α	CFR	AVE
Usage	Use1	0.86	18.85	0.8269	0.8276	0.7060
	Use2	0.82	15.88			
Use intention	UI1	0.95	33.78	0.9559	0.9540	0.9121
	UI2	0.96	35.63			
Performance expectancy	PEXP1	0.90	24.67	0.9260	0.9278	0.7630
	PEXP2	0.90	24.80			
	PEXP3	0.89	24.39			
	PEXP4	0.80	19.23			
Effort expectancy	EE1	0.90	20.69	0.9295	0.9290	0.7661
	EE2	0.85	18.74			
	EE3	0.89	20.22			
	EE4	0.86	19.25			
Perceived enjoyment	PE1	0.91	27.05	0.9466	0.9477	0.8191
	PE2	0.91	27.51			
	PE3	0.89	25.40			
	PE4	0.91	26.99			
Autonomy	AUT1	0.91	20.71	0.9093	0.9117	0.7749
	AUT2	0.87	19.46			
	AUT3	0.86	18.89			
Relatedness	REL1	0.89	20.21	0.9136	0.9143	0.7806
	REL2	0.86	18.96			
	REL3	0.90	20.70			
Competence	COM1	0.89	19.80	0.8989	0.9006	0.7514
	COM2	0.86	18.98			
	COM3	0.85	18.54			

participation was voluntary and compensated with wining a sweepstake and class participation points. A hands-on session lasting 30 min was performed by the instructor before introducing the system. Subjects were required to visit the site, use the basic features, and communicate with other users during the first week. Instructors helped them to become familiar with the system during this period. At the end of the period (Week 1), the questionnaire was distributed and first responses were collected (Experiment Group1 (EG1) = 57, Experiment Group 2 (EG2) = 65). In the following three weeks, links to the sites hosting music sharing, online gaming, and jokes were posted on the Qboard to induce intrinsic motivation. Different contents of intrinsic motivation were introduced to prevent the learning effect or losing interest by users during these weeks. The questionnaire was administered again at the end of the period (*t*2, Week 4) and obtained 55 (EG1) and 63 (EG2) usable responses. In the next three weeks, two different types of extrinsic motivation were introduced, and their effects were measured at the end of the period (*t*3, Week 7). To induce controlled extrinsic motivation, we advertised and awarded gift certificates or football tickets, and to induce autonomous extrinsic motivation, we announced the Hall of Fame, which lists those who posted the most useful and interesting message and practice questions for quizzes and the mid-term exam. In total, 58 (EG1) and 66 (EG2) subjects responded. In the final three weeks that followed, intrinsic incentives, similar to those given at *t*2 but with different contents, were provided to both experiment groups. The fourth questionnaire was obtained at the end of the period with 52 (EG1) and 55 (EG2) responses (*t*4, Week 10).

The same manipulations were applied to the control group as the experimental group except during the third period (see Fig. 2). The purpose of the control group was to test for possible learning effect across the four time periods to make sure that the major effect at *t*4 related to intrinsic motivation actually comes from the introduction of extrinsic motivation at *t*3. Subjects filled out the same questionnaires four times except that the order of questions on each questionnaire was randomly changed.

4.2.2. Study 2: Results

We summarize in Table 4 each of the hypotheses tested at each of the time periods, $t = 1$ thru $t = 4$, and the associated findings. The first six rows of the table reports whether there was any significant difference in the use across the different time periods for each of the two experimental and one control groups. The next eight rows

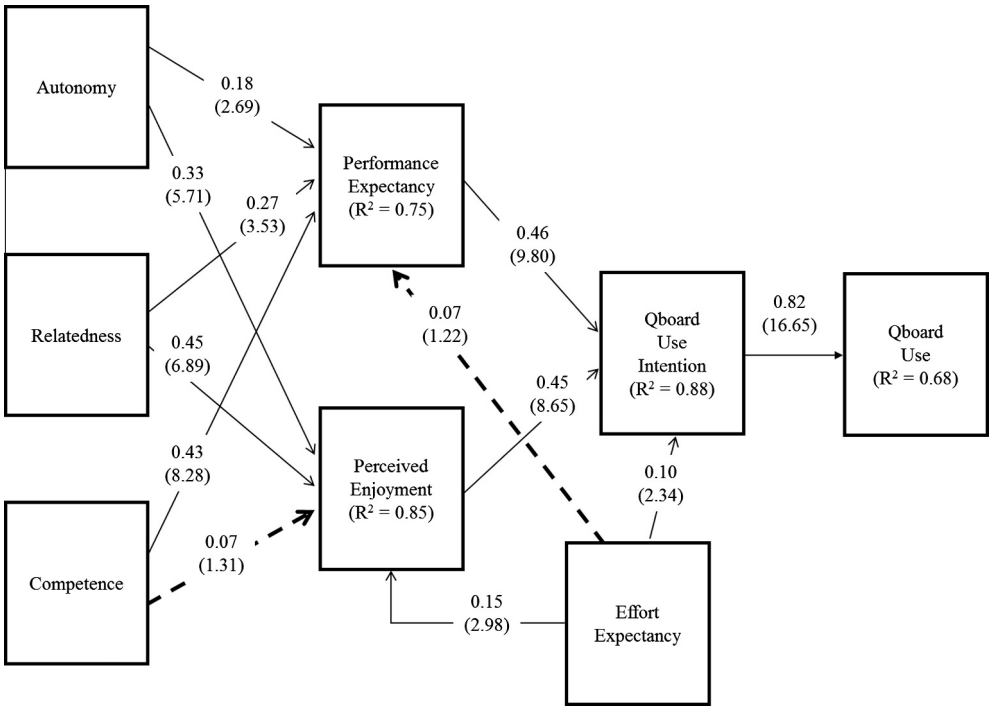

Fig. 1. Results of structural equation model. *Path loading (*t*-value).

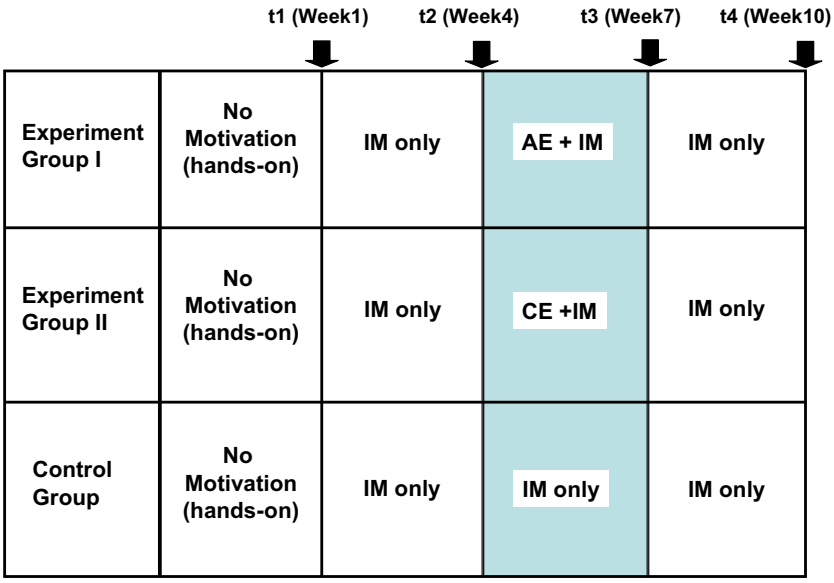

Fig. 2. Experimental design. *IM: Intrinsic Motivation, AE: Autonomous Extrinsic Motivation, CE: Controlled Extrinsic Motivation.

reports for each of the time periods, $t = 1$ thru $t = 4$, whether there was any significant difference in the use across the three groups.

We found that there is no significant difference ($F_{(2,177)} = 0.160$, $p = 0.852 > 0.05$) among the group's Qboard use at $t1$, reflecting that the subjects were assigned randomly. We also compared each group at $t2$, and there was no significant difference in their use ($F_{(2,177)} = 0.610$, $p = 0.554 > 0.05$), indicating that the subjects in each group responded similarly to intrinsic motivation. To examine whether intrinsic motivation affects use, the use at $t1$ and at $t2$ were compared. It was found that intrinsic motivation significantly increased their use across all groups (EG1: $t = 1.997$, $p = 0.048 < 0.05$; EG2: $t = 1.985$, $p = 0.049 < 0.05$; CG3: $t = 2.760$, $p = 0.007 < 0.01$). At $t3$, we found that the use of each group is significantly different from one another ($F_{(2,180)} = 4.982$, $p = 0.008 < 0.01$). In particular, the use of the experiment group 1 (autonomous extrinsic motivation) and that of the experiment group 2 (controlled extrinsic motivation) were significantly different from that of the control group (intrinsic motivation). However, there was no significant difference in use between the experiment groups at $t3$ ($t = 0.580$, $p = 0.563 > 0.05$). In addition, it was found that both autonomous and controlled extrinsic motivations significantly increased the use at $t3$ for both experiment groups (EG1: $t = 2.774$, $p = 0.007 < 0.01$, EG2: $t = 2.656$, $p = 0.009 < 0.01$) compared to the respective use at $t2$.

At $t4$, the use of each group was also significantly different from one another ($F_{(2,156)} = 6.700$, $p = 0.002 < 0.01$). In particular, the use of the autonomous extrinsic motivation group ($t = -3.742$, $p = 0.000 < 0.001$) and that of the control group ($t = 2.706$, $p = 0.008 < 0.001$) were significantly greater than that of the controlled extrinsic motivation group. However, there was no significant use difference between the autonomous extrinsic motivation group and the control group ($t = -0.951$, $p = 0.344 > 0.05$). In addition, the use of the autonomous extrinsic motivation group and the controlled extrinsic motivation group at $t4$ were significantly less than that at $t3$ ($t = -2.101$, $p = 0.038 < 0.050$; $t = -6.204$, $p = 0.000 < 0.001$ respectively), while that of intrinsic motivation group was not ($t = -0.386$, $p = 0.701 > 0.05$).

To test whether extrinsic motivation interacts with the intrinsic motivation when a task is intrinsically motivated and then extrinsically motivated (H2), we compared the use of each group at $t2$ and $t4$. When intrinsic motivation was followed by autonomous extrinsic motivation, it was found to augment intrinsic motivation; the mean use at $t4$ ($\mu = 3.827$) was greater than that at $t2$ ($\mu = 3.618$). However, the effect is not statistically significant ($t = .950$, $p = 0.344 > 0.05$). On the other hand, when intrinsic motivation was followed by controlled extrinsic motivation, it was found to strongly undermine intrinsic motivation. For experiment group 2 (controlled extrinsic motivation), the mean use at $t4$ ($\mu = 3.109$) was smaller than that at $t2$ ($\mu = 3.754$), and the difference was significant ($t = -2.680$, $p = 0.008 > 0.01$). Therefore, H2 is partially supported. The detailed results are shown in Fig. 3 and Table 4.

5. Discussion

This study yields the findings that help us better understand the motivational nature of technology acceptance. Empirically, this study renders a partial support for the hypothesized relation between the motivational constructs and the ICT acceptance constructs. It supports the hypothesized positive relation between two of the motivation–theoretic constructs (*Autonomy* and *Relatedness*) and the *Perceived Enjoyment* construct. This support can be interpreted as confirming either the status of *Perceived Enjoyment* as a surrogate construct for intrinsic motivation, or the validity of the three motivational constructs as determinants of intrinsic motivation in the context of technology acceptance, or both.

On the other hand, the study reveals the relationship between *Competence* and *Perceived Enjoyment* to be non-significant. This finding was puzzling to us initially because in our mind *Competence* contributes to the feeling of challenge and/or self-confidence, which would contribute to intrinsic motivation. However, it might be explained by the fact that the technology in question—Qboard—was perhaps not challenging enough. By now, students might be familiar with the kind of features associated with a threaded bulletin board like Qboard so that *Competence* did not play much role in the context of this study.

The study also supports the hypothesized positive relationship between all the three motivation–theoretic determinants and *Performance Expectancy*. We may or may not construe this finding as supporting the proposed rationale that when one is intrinsically motivated to use a technology, one's perception of the usefulness for the technology is enhanced as well. If we do not accept this explanation, however, then it behooves us to account for this

Table 4
Results of study 2.

Hypotheses	Results	Significance
For EG1 (Autonomous Extrinsic), if (Use at $t2$ = Use at $t3$ = Use at $t4$)	$F_{(2,162)} = 4.612$, $p = 0.011 < 0.05$	Significant
• Use at $t2$ = Use at $t3$	$t = 2.774$, $p = 0.007 < 0.01$	Significant
• Use at $t2$ = Use at $t4$	$t = 0.950$, $p = 0.334 > 0.05$	Insignificant
• Use at $t3$ = Use at $t4$	$t = -2.101$, $p = 0.038 < 0.05$	Significant
For EG2 (Controlled Extrinsic), if (Use at $t2$ = Use at $t3$ = Use at $t4$)	$F_{(2,181)} = 15.283$, $p = 0.000 < 0.05$	Significant
• Use at $t2$ = Use at $t3$	$t = 2.656$, $p = 0.009 < 0.01$	Significant
• Use at $t2$ = Use at $t4$	$t = -2.680$, $p = 0.008 < 0.01$	Significant
• Use at $t3$ = Use at $t4$	$t = -6.204$, $p = 0.000 < 0.001$	Significant
For CG, if (Use at $t2$ = Use at $t3$ = Use at $t4$)	$F_{(2,172)} = 0.592$, $p = 0.554 > 0.05$	Insignificant
• Use at $t2$ = Use at $t3$	$t = -0.673$, $p = 0.502 > 0.05$	Insignificant
• Use at $t2$ = Use at $t4$	$t = -1.113$, $p = 0.268 > 0.05$	Insignificant
• Use at $t3$ = Use at $t4$	$t = -0.386$, $p = 0.701 > 0.05$	Insignificant
At $t = 1$, if (Use of EG1 = Use of EG2 = Use of CG)	$F_{(2,177)} = 0.160$, $p = 0.852 > 0.05$	Insignificant
• Use of EG1 = Use of EG2	$t = 0.572$, $p = 0.568 > 0.05$	Insignificant
• Use of EG1 = Use of CG	$t = 0.267$, $p = 0.790 > 0.05$	Insignificant
• Use of EG2 = Use of CG	$t = -0.289$, $p = 0.773 > 0.05$	Insignificant
At $t = 2$, if (Use of EG1 = Use of EG2 = Use of CG)	$F_{(2,177)} = 0.610$, $p = 0.544 > 0.05$	Insignificant
• Use of EG1 = Use of EG2	$t = 0.574$, $p = 0.567 > 0.05$	Insignificant
• Use of EG1 = Use of CG	$t = 1.118$, $p = 0.266 > 0.05$	Insignificant
• Use of EG2 = Use of CG	$t = 0.427$, $p = 0.670 > 0.05$	Insignificant
At $t = 3$, if (Use of EG1 = Use of EG2 = Use of CG)	$F_{(2,180)} = 4.982$, $p = 0.008 < 0.01$	Significant
• Use of EG1 = Use of EG2	$t = 0.580$, $p = 0.563 > 0.05$	Insignificant
• Use of EG1 = Use of CG	$t = -2.334$, $p = 0.021 < 0.01$	Significant
• Use of EG2 = Use of CG	$t = -2.960$, $p = 0.004 < 0.01$	Significant
At $t = 4$, if (Use of EG1 = Use of EG2 = Use of CG)	$F_{(2,156)} = 6.700$, $p = 0.002 < 0.01$	Significant
• Use of EG1 = Use of EG2	$t = -3.742$, $p = 0.000 < 0.001$	Significant
• Use of EG1 = Use of CG	$t = -0.951$, $p = 0.344 > 0.05$	Insignificant
• Use of EG2 = Use of CG	$t = 2.706$, $p = 0.008 < 0.01$	Significant

EG1: experiment group 1, EG2: experiment group 2, CG: controlled group.

finding in future studies. Such studies might find the mapping of *Perceived Enjoyment* and *Performance Expectancy*, respectively, to intrinsic and extrinsic motivation somewhat too simplistic.

The study also provides a clarification on the effect of extrinsic motivation on inherently intrinsically motivating tasks. The result indicates that extrinsic motivation does undermine intrinsic motivation but only with controlled extrinsic motivation. This result is consistent with the general motivation research but not with the earlier assumption that this finding does not hold for ICT because its use is not intrinsically motivating in the first place (1989). This inconsistency seems to support our conjecture that the user interface, as well as the content accessible through ICT, has become interesting enough to make its use intrinsically motivating since the early studies.

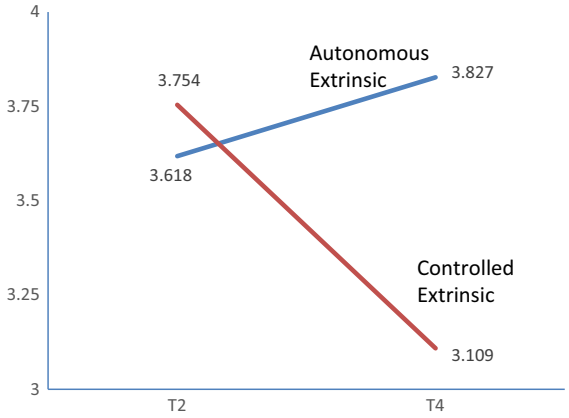

Fig. 3. Mean use differences of experiment group 1 and group 2 at $t2$ and $t4$.

6. Implications and conclusion

The findings of this study provide several implications for both researchers and practitioners. Theoretical implications could be examined from the perspectives of the two major theories tested in this study, namely the ICT acceptance and the self-determination theory. From the ICT acceptance perspective, the findings from this study help clarify different types of motivation in the technology acceptance decisions. Starting with Davis (1989), *Performance Expectancy* was considered a construct capturing extrinsic motivation and *Perceived Enjoyment* and *Effort Expectancy* capturing intrinsic motivation. Although these associations were intuitively plausible and made with a reference to Deci's motivation theory, the relationship between self-determination theory and ICT acceptance was never made explicit, let alone tested.

Through investigating the relationship, the study confirms the association of *Performance Expectancy* with extrinsic motivation and *Perceived Enjoyment* with intrinsic motivation, and the hypothesized relationships between the self-determination theory constructs and the ICT acceptance constructs.

This study also confirms the well-known negative effect of extrinsic motivation on intrinsic motivation even in the context of the ICT acceptance. While previous studies have examined the effect of intrinsic and extrinsic motivation on the technology acceptance (e.g., Venkatesh & Speier, 2000) and have found they are positively related to the acceptance, the results were different from those of this study. That is because they did not capture the effect of the sequential introduction of intrinsic and extrinsic motivation. Davis et al. (1992) criticized the examination of a negative effect, noting that the negative effect would not hold in technology acceptance decisions, because the use of technology is not typically intrinsically motivating. That may well be true. However, as information technologies have recently come to embed more intrinsic motivation (e.g., fun, game, virtual reality, attractive interface, and curiosity) into their main features, the basic assumption of Davis et al. (1992) needs to be reexamined.

This study used the experimental settings for the sequential introduction and found that there exists the negative effect between intrinsic and extrinsic motivation when controlled extrinsic motivation is introduced and the augmented effect between

them when autonomous extrinsic motivation is introduced. The findings of this study, therefore, clarify a boundary condition of the ICT acceptance by delineating when intrinsic and extrinsic motivation augment or undermine each other in their effect on the intention to use technology.

From the self-determination theory perspective, this study reconfirms the negative effect of extrinsic motivation on intrinsic motivation in yet another context. In our belief, the evidence for the negative effect is undeniable on both scientific and intuitive grounds. The right question to ask seems to be not if such effect is real but in what context the effect is visible or not. This study is a contribution toward further clarifying that question.

Better understanding of the different categories of motivation and their influence on behavior typically lead to practical insights. This study suggests that managers should be careful about using extrinsic motivation to boost performance, as it might undermine the intrinsic motivation when the extrinsic motivation is discontinued. Managers should consider both types of motivation to increase employee's technology use. They need to examine the main features of a specific technology, identify the strength of each motivation and the possibility of a negative effect, and, finally, decide what types of motivation is appropriate for the given situation.

The practical importance of such studies extends beyond technology use within a specific organization. Recently, many technologies have appeared that support knowledge sharing beyond the company boundaries. For example, the new genre of knowledge sharing communities, such as askme.com or askexpert.com, pulls together the resources of people's expertise at large and makes them available to the others. Such a tool allows its users to communicate without being confined to the present time and physical boundaries. These sites offer both types of motivation for people to share their knowledge. However, few sites are successful. This study provides a possible explanation, noting that it is because the sites introduced extrinsic and intrinsic motivation interchangeably. This study provides an important implication that managers and designers of the sites, therefore, should be careful when they introduce different types of motivation sequentially.

The study has several limitations. The small sample size of Study 2 and the use of a single technology and the university environment with the student subjects are the major limitations. The small sample size was necessitated by the need for a longitudinal study within a university setting. Also, previous studies indicate that student subjects in the university environment may not reflect the business environment. In addition, we did not examine the effect of grade despite of the potential high correlation between grade and motivations. Further, the use of a single technology limits the generalizability of the study findings across diverse technologies. Future studies could address these issues.

The question of whether a technology will be successfully accepted and used often leads to the question of what motivation its potential users would have for using it. This study has taken the self-determination theory and tested it under knowledge sharing technology use context. In particular, it has examined how the concepts of intrinsic motivation and extrinsic motivation in the motivation research are related to the constructs in the ICT acceptance models.

The results confirmed the major findings from both the self-determination theory and ICT acceptance. The study has successfully confirmed the relationship between the self-determination theory constructs and ICT acceptance constructs. Furthermore, the study has demonstrated that the negative effect does hold if controlled extrinsic motivation follows intrinsic motivation, while the augmented effect does hold if autonomous extrinsic motivation follows intrinsic motivation.

Despite the limitations discussed in the previous section, the study points to the importance of taking the motivational perspective in technology acceptance research and makes the first step in relating the research to the existing body of knowledge on motivation that has been cumulated in other disciplines. We hope that the study opens a door for many studies that could lead to fruitful theoretical and practical insights.

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