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Adopting New Software: Drivers of Voluntary Adoption in the same Product Category

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ABSTRACT

Information systems use research has investigated post-adoption issues as a means for identifying the factors that are relevant for long term IS success. Our objective in this study is to investigate voluntary adoption decisions of new software in an organizational setting. We study how attributes of prior use, perceived ease of use and perceived usefulness affect knowledge transferability and adoption intention of new software in the same primary base domain. Our study was based in the context of changeover of a course management system at a small Southern University. Data was collected from 81 faculty members about their intention to adopt the new CMS. Results indicate that in the context of voluntary adoption of new software in the same primary base domain, habit and knowledge transferability are positively associated with adoption intention while frequency of feature use is negatively associated.

Keywords

Adoption, Course Management Systems, Knowledge Transferability, Use.

INTRODUCTION

Information systems (IS) acceptance research has recently shifted focus from adoption issues to issues of adaptation and long-term use. While adoption models of continued use treat use as an extension of the adoption decision (Karahana, Straub and Chervany 1999), models of continued use focus on separate post adoption drivers such as habit, expectation confirmation and satisfaction. The dichotomy between the adoption decision and the use decision masks the fact that adoption decisions of new software in the same product category can also be modeled as an extension of the continued use.

Adoption of new software poses significant challenges; new software carries with it associated learning and setup costs. When two software products in the same product category, are similar to each other in terms of features, functionality and the benefits provided we refer to them as belonging to the same primary base domain (Moreau, Lehman and Markman 2001). Learning differences are more marked for users switching across product domains than for users switching within product domains. Complex multi-faceted software has multiple sub domains of knowledge, many features, and users have varying levels of experience with these features. Users develop habits through frequent use of software and its features as well as satisfaction with the software (Limayen, Hirt and Cheung 2007).

Software users acquire domain expertise and knowledge from use of software. Prior use, domain expertise and knowledge gained from prior use, however, have not been studied extensively in IT adoption decisions (Jasperson et al. 2005). Knowledge gained from prior use influences how adopters process information, and their perception of search and switching costs. The impact of prior use and knowledge transferability in the individual adoption decision is likely to vary based on user familiarity with the software and their perception of the new software.

Adoption of new software by users of the software product category has its nomological roots in adoption research (Venkatesh and Davis 2000), post adoption research (Jasperson et al. 2005) as well as repeat and repurchase decision

research in marketing (Moreau et al. 2001). From post-adoption research we draw on the role of feature use and habitual use in the adoption of new software by users of the software. From marketing literature we draw upon the role of knowledge transfer in the adoption of new products in the same primary base domain. And finally from adoption research we incorporate how perceived usefulness and ease of use of the current software influences the adoption intention of new software. Our objective in this study is to investigate how attributes of prior use, perceived ease of use and perceived usefulness affect knowledge transferability and adoption intention of new software in the same primary base domain. Our model focuses on individual voluntary adoption decisions of new software in an organizational setting. More specifically, the paper makes the following contributions to the research on information systems adoption and use:

- Differentiates between different types of use, such as frequency of feature use and habitual use.
- Separates prior use and knowledge gained from prior use and treats them as distinct drivers of software adoption intention by users of the software product category.
- Integrates perceived usefulness and ease of use of current software with use types and knowledge transferability to develop a richer model of adoption intention of new software in the same primary base domain.
- Empirically tests the research model in the context of adoption of a course management system (CMS) by faculty in a small southeastern university.

In the sections that follow, we present the research on IS adoption; continued IS use and knowledge transferability. We then present the research model, data collection and measurement and finally the results and discussion.

Perceived Usefulness and Ease of Use

Behavioral intention to adopt software is influenced by two key technology perceptions, perceived usefulness and perceived ease of use in the Technology Acceptance Model (TAM) (Davis 1989). Perceived usefulness is defined in terms of the degree to which the software would improve job performance. Perceived ease of use is the degree to which using the software would be free of effort. Perceived ease of use affects adoption intention in two ways, first by directly impacting adoption intention and by impacting perceived usefulness which in turns impacts adoption intention.

TAM implies that users make perceived usefulness, perceived ease of use and behavioral intention decisions in each time period without relying on prior behavior (Kim and Malhotra 2005). The theory of belief updating (Hogarth and Einhorn 1992) argues that people do not perceive an external stimulus just the way it is presented. Prior knowledge is adjusted based on the evidence that follows. Belief updating has been used to study intertemporal changes in intention to purchase a product (Labarbera and Mazursky 1983; Mittal, Kumar and Tsiros 1999) and customer satisfaction (Mittal et al 1999). Based on the theory of belief updating, users' perceptions of usefulness and ease of use of the software in period t , will influence their perceptions of the new software in same primary base domain in period $t+2$. When users of a software domain adopt new software in the same base domain, they have prior perceptions about the perceived usefulness and ease of use of software they are using. These perceptions will overlay and color the perceptions of the new software.

Prior Use

Prior use has emerged as a significant factor in post adoptive behavior research in IS literature (Jasperson, Carter and Zmud 2005, Karahana et al. 2009). Direct experience with a behavior can override perceptions of usefulness and ease of use and plays strong role in predicting future behavior (Szajna and Scamell 1993; Venkatesh, Speier, and Morris 2002). Adopters of new products are heavily drawn from current users of products within the same product category (Gatignon and Robertson 1985; Dickerson and Gentry 1983). Prior use has also been related to habit as it has been suggested that frequent use results in the likelihood that the behavior will become habitual over time, given a stable context (Limayem et al. 2007). Prior use has been included in IS research as computer skill, experience, and duration or use (Venkatesh, Morris, Davis and Davis 2003) but not in terms of features or knowledge. When studying prior use, use itself has been treated as a blackbox (Jasperson et al.2005). Where feature level analysis has been conducted the focus has been on number of features used over time, their complexity and the value derived from them (Kay and Thomas 1995).

In marketing research, customer familiarity and expertise influence customer evaluation and retention. Customers who have more extensive users of the product features are more likely to be satisfied with the product (Burnham, Frels and Mahajan 2003) and satisfied users are more likely to have repurchase intentions for the product (Soderland 2002). In this study prior use has been conceptualized in terms of two distinct components, frequency of feature use and habitual use.

Knowledge Transferability

Prior purchase experience influences customer knowledge of the product (Soderlund 2002) which in turn is likely to influence customer information processing activities (Alba and Hutchinson 1987). Psychology and consumer behavior

literature suggests that prior knowledge influences how users think about new products (Gregan-Paxton and John 1997) which in turn influences the diffusion of products over time (Rogers 2003). Entrenched knowledge influences consumers' response to new products (Moreau et al. 2001). Prior domain knowledge results in greater adoption of continuous innovations, such as those in the same primary base domain, rather than discontinuous innovations. Moreau et al. (2001) use the term attribute mutability to characterize the degree of transferability of features from the existing category schema to the schema of the new software product. The more immutable the feature changes from the existing product to the new product, the more difficult it will be for users to transfer knowledge from the existing product to the new product. Knowledge transferability will influence users' response to new products in an existing product domain.

There are costs associated with learning about the new product, software and providers (Klemperer 1995). Prior use determines users perceptions of product compatibility and complexity as well as relative advantage (Rogers 2003) and risk (Ram and Sheth 1989). Users beliefs about attribute mutability between the current product and the new product influences their perception of the new product (Love 1996) and belief updating enables users beliefs of knowledge transferability to be colored by their earlier beliefs (Hogarth and Einhorn 1992).

The Research Model

This research model looks beyond adoption at time t , and continued use at time $t+1$, to the intention to changeover to a new software in the same primary base domain at time $t+2$. Research has shown that when users find a technology easy to use, they also perceive it to be more useful. Software that is perceived to be easy to use will be used to a greater extent in task activities, increasing its perceived usefulness. At the same time, as users continue to use the software over a period of time, the impact of perceived ease of use on the continuation decision declines in importance (Karahanna et al. 1999). Perceived usefulness of the software being used will be the same as the perceived usefulness of new software because they belong to the same primary base domain. This leads us to the following hypotheses:

Hypothesis H1: Perceived ease of use of the software being used is positively associated with perceived usefulness of the software being used.

Hypothesis H2: Perceived usefulness of the software being used is positively associated with intention to adopt the new software in the same primary base domain

Users' prior evaluations of software will affect future evaluations of software in the same primary base domain (Kim and Malhotra 2005). Adoption theories generally treat perceived usefulness and ease of use of software being adopted as independent of perceptions and evaluations in prior time periods. Consumer behavior research has shown that users' perceptions and evaluations are based on their prior perceptions and evaluations (Mittal et al. 1999). Beliefs about the perceived ease of use of the new software are updated based on the beliefs about the perceived ease of use of the current software in the same primary base domain.

When considering software in the same base domain, perceptions of perceived usefulness are likely unchanging. The easier to use the current software is perceived to be, the more likely it is that users will perceive that any software in the same primary base domain will also be easy to use. When users perceive that the new software is easy to use, they believe that they can transfer their existing knowledge in the primary base domain to the new software. According to knowledge transfer research, learning occurs in three stages, access, mapping and transfer (Gregan-Paxton and John 1997). When the target software is in the same primary base domain, access can occur spontaneously based on user experience with the software. When users see the new software, they map its content and structure with the software they have been using. In the same primary base domain the attributes and relationships are likely to be similar to the software that they have been using. This leads us to the following hypotheses:

Hypothesis H3: Perceived ease of use of the software being used is positively associated with perceived ease of use of the new software in the same primary base domain.

Hypothesis H4: Perceived ease of use of the new software is positively associated with knowledge transferability.

Users have entrenched knowledge structures of the base domain that are based on the features of the product and the relationships between them (Moreau et al. 2001). Habitual users of a product, and users who frequently use product features gain expertise in the primary base domain. Products in the same primary base domain are likely to have the same attributes and relationships with minor changes between them. For products in the same product category, these features and relationships remain mostly unchanged. An expert user will likely be able to transfer a significant amount of knowledge from the current software to the new software. This leads us to the following hypotheses.

Hypothesis H5: Frequency of feature use is positively associated with knowledge transferability

Hypothesis H6: Habitual use is positively associated with knowledge transferability

When users continue using the software, use decisions become habitual and routinized (Conner and Armitage 1998). When presented with new software in the same primary base domain users need to alter their habitual behavior. But because the software is in the same primary base domain, deep structures and mental scripts of the users are likely to remain undisturbed. In terms of punctuated equilibrium theory (Gersick 1991), adoption of new software in the same primary base domain constitutes incremental rather than radical change. Users who have been using the software habitually and using a wide range of features are likely to adopt the new software in the same primary base domain. This leads us to the following hypothesis:

Hypothesis H7: Frequency of feature use of software is positively associated with adoption intention of new software in the same primary base domain

Hypothesis H8: Habitual use of software is positively associated with adoption intention of new software in the same primary base domain.

The less immutable the users perceive the feature change to be between the two software products, the more easily they can map the features of the new product in terms of their knowledge about the current category structure (Moreau et al. 2001, Love 1996). The perception that this knowledge transfer as easier, the more likely users are to believe that it will be easy for them to comprehend, and use the new software product. If the users perceive that it is easy for them to transfer their knowledge from the current software to the new software, they are more likely to adopt the new software is the same primary base domain.

H9: knowledge transferability is positively associated with adoption intention

The research model is presented below.

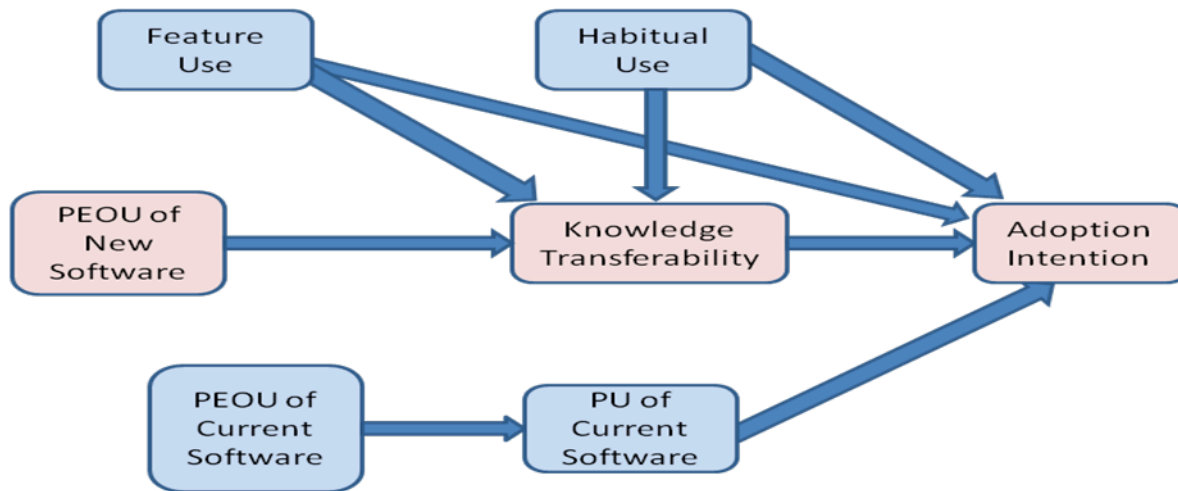


Figure 1: The Research Model

DATA COLLECTION: COURSE MANAGEMENT SYSTEM (CMS) AT A SOUTH EASTERN UNIVERSITY

The study was done at a relatively small University, in the South Eastern region of the United States. The context for the study was provided by the changes in the CMS used by the university. Faculty decision to use a CMS for their courses was completely voluntary and while the university promoted use, it did not mandate use. Because of changes in licensing, the university decided to review its options for CMS and went through a formal evaluation process. For some time, faculty had the choice of using either WebCT/blackboard or Angel as the CMS of choice. This provided the ideal setting for our study.

Sample and Procedure

The sampling frame was the entire faculty at the University. The survey was made available on Lime Survey, an open-source software survey administration installed on the university's servers. The link for the website was provided in individually addressed e-mails. In addition a printed copy of the mail survey was mailed through campus mail. One week after the first-email a reminder was sent, with the option of receiving a printed copy of the questionnaire.

The effective sampling frame was 382 and we received 148 responses yielding a response rate of 38.7 percent. We discarded 30 responses that were incomplete, yielding a usable sample of 118 responses of which 81 were users of CMS. As expected, a majority of the respondents (55%) were full-time faculty, 19.6 % held visiting positions while 14.9% were adjunct. Non-response bias was assessed by (i) comparing the distribution of responses across the colleges with the distribution in the sampling frame and (ii) comparing the first quartile respondents with respondents in the last quartile (Armstrong and Overton 1977) and it did not indicate the presence of a potential issue with non-response bias in the sample.

Measurement

We used previously validated scales to the extent possible and modified them to fit the context of switching from one CMS to another. Frequency of use was how frequently different features of CMS were used (See Appendix for measures). Habitual use was based on items used by Limayem et al. (2007). The construct for knowledge transferability was derived from the work of Moreau et al. (Moreau et al. 2001) on entrenched knowledge structures. The other constructs relating to use and adoption were derived from research on adoption and technology acceptance (Bhattacharjee 2001; Jaspersen et al. 2005; Venkatesh et al. 2003). Faculty members at multiple schools evaluated the constructs in the survey instrument. While there were some concerns with combining WebCT and Blackboard, we retained the wording of the study in the interests of survey length and because our focus was on prior use experience. This may be considered as a limitation of the study.

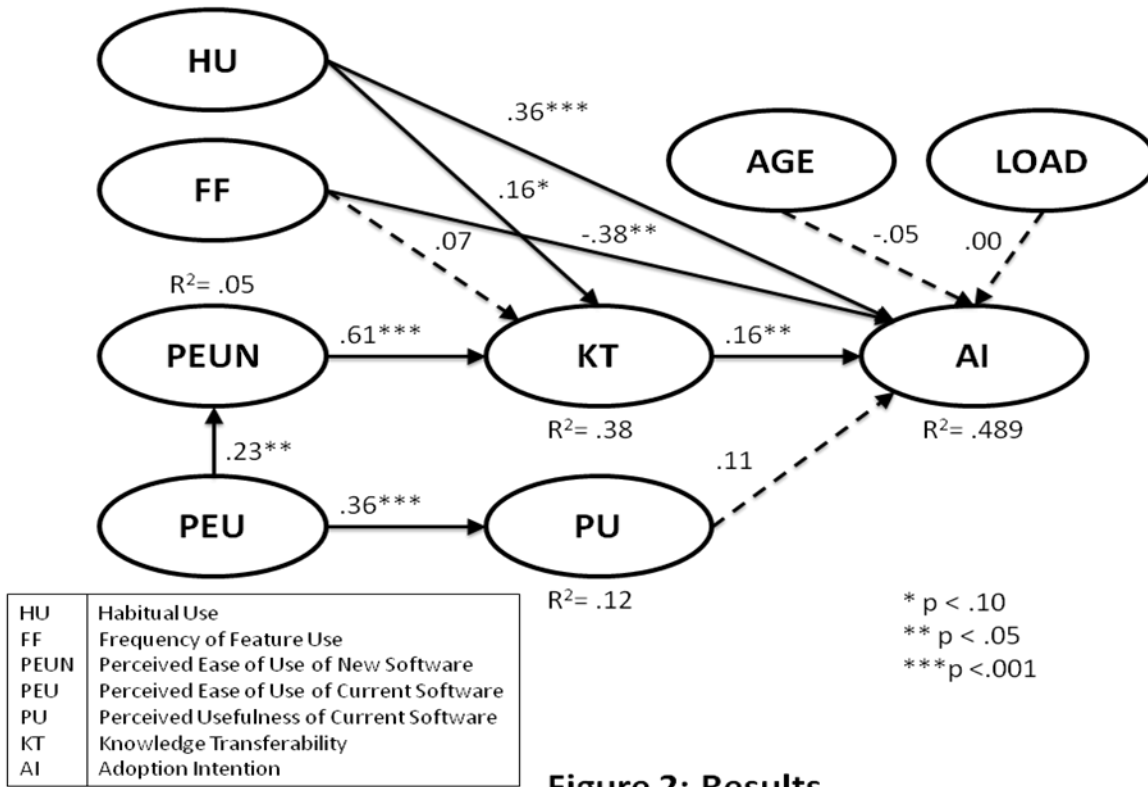
RESULTS

Measurement Validation

In this analysis we focus on the subsample of 81 current users of the CMS. Using PLS, we simultaneously assessed the measurement and the structural model for our research model. Significance of the results is based on 400 subsamples using the bootstrapping technique. Analysis of the measurement model was done by assessing factor loading, internal consistency, cross loadings, and discriminant analysis. Frequency of feature use was modeled as a formative construct. Usage of chat, student learning activity tools and student tools had significant weights at .10 level as compared to the others. Three of the measurement items in the knowledge transferability construct did not load adequately and were dropped from further analysis. All retained measurement items had a factor loading greater than the recommended minimum loading of .707. Reliability and convergent validity was assessed using composite reliability, average variance extracted (AVE) and examining the cross loading of items with other constructs in the research model (Karahanna et al. 1999). Composite reliability of all the constructs was 0.80 or more. AVE for each construct was greater than .50.. We examined discriminant validity by comparing the correlation between constructs with the square root of AVE of individual constructs. The correlations of all variables were all below the square root of AVE of each construct. We also examined if items belonging to a construct loaded more on their corresponding construct than other constructs using the steps outlined by Karahanna et al.(1999). These results are not shown to conserve space. In summary, the analysis of the measurement model provides evidence of adequate reliability and validity.

Model Testing

The model explained 48.9% of the variance in the intention to adopt the new CMS. Habitual use (.358, $p < .0001$) and knowledge transferability (.159, $p < .05$) were strongly associated with the adoption intention. Frequency of feature use (-.379, $<.05$) was negatively associated with adoption intention. Age, course load, and perceived usefulness were not related to adoption intention. Perceived ease of use (.617, .001) of the new software was strongly related to knowledge transferability. Habitual use was associated with knowledge transferability (.161, $<.10$) but frequency of feature use had no impact on knowledge transferability. Perceived ease of use of the current software (.233, $<.05$) was strongly related to the perceived ease of use of the new software. The results are given below in Figure 2. Table 1 below provides a summary of results for the hypotheses.



Hypothesis	Relationship	Result
H1	PEU(current) → PU (current)	Supported
H2	PU(current) → AI	
H3	PEU(current) → PEUN(new)	Supported
H4	PEUN(new) → KT	Supported
H5	FF → KT	
H6	HU → KT	Supported
H7	FF → AI	Reversed
H8	HU → AI	Supported
H9	KT → AI	Supported

Discussion and Conclusion

The purpose of this study is to evaluate how attributes of prior use and knowledge transferability effect voluntary adoption of new software in organizations when the software belongs to the same primary base domain. Our results indicate that adopting new software in this context is an incremental change decision in punctuated equilibrium and is impacted by habitual use of current software. Perceived usefulness of the current software does not impact the adoption of new software in the same primary base domain. This is an interesting finding. It is possible that users are not consciously making an adoption decision when evaluating the usefulness of the new software since the software belongs to the same primary base domain and incremental change processes guide their adoption decisions (Kim and Malhotra 2005).

When users perceive that the current software is easy to use, these beliefs update their beliefs of the new software in the same primary base domain (Hogarth and Einhorn 1992). Users that believe that the new software will be easy to use are confident in their self-assessed knowledge to adopt and adapt to a new system. They believe that their knowledge will be easily transferable across two software products in the same primary base domain.

Interestingly, feature use has a significant negative impact on adoption intention; this result is reverse of the hypothesized positive association. Feature use is also not related to knowledge transferability. Users who frequently use multiple features of the software develop a commitment to the current software. When these users have to shift to new software, they need to invest in learning how to transfer their installed knowledge and content base to the new software (Burnham et al. 2003). Frequent features users have higher investments in the software, having worked through its intricacies and customized and configured various features to serve their needs (Bhardawaj, Varadarajan and Fahy 1993).

Our study has interesting implications for knowledge workers in organizations that are presented with voluntary adoption decisions for new software in the same primary base domain. The biggest challenge to voluntary adoption of software in organizations may be perceptions of current software. When organizations adopt new software in the same primary base domain, they may face dual challenges. Users who find current software difficult to use are likely novice and light users. On the one hand they need to convince users with negative prior experiences to evaluate the new software as a distinct product category for which a series of positive product encounters can be created to encourage use (Soderlund 2002). For users with extensive prior experiences the opposing challenge would be convince them of the similarities in the features and attribute relationships between the software being used and the new software. Software products that build on the well-established product category knowledge of expert users may encourage committed users to adopt new software.

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APPENDIX A**Survey Items**

FF Frequency of use (*User response options were very frequently, frequently, occasionally, rarely, never*)

For each of the features below, please indicate how frequently you use them.

Content Tools: Such as posting learning modules, content, files etc.

Email

Chat

Discussion board

Student Learning Activity: such as submitting assignments, quizzes, tests etc

Student Tools : such as gradebook, student notes etc.

Organizational Tools : such as calendars, syllabi etc.

The following scales use a Likert-type scale where respondents indicate the extent of their agreement with the statements by selecting one of the five options Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

HU Habitual Use

I use WebCT/Blackboard every semester

I am usually logged into WebCT/Blackboard whenever I am working.

I am usually logged into WebCT/Blackboard whenever I am working.

I routinely use WebCT/Blackboard to manage my courses

Logging onto WebCT/Blackboard is usually one of the first things I do on a workday

KT Knowledge Transferability¹

I expect the user interface of Angel will be similar to WebCT/Blackboard.

Having used WebCT/Blackboard, I should have no difficulty using Angel.

I expect the features and functionality of Angel will be the same as WebCT/Blackboard.

I expect icons/menu items in Angel to be the same as in WebCT/Blackboard.

With my experience in using WebCT/Blackboard, Angel will offer no surprises to me.

I will be able to use Angel just like I used WebCT/Blackboard.

PEU Perceived Ease of Use of Existing Software

Learning to use WebCT/Blackboard is easy for me.

Using WebCT/Blackboard is involved requiring a lot of effort.

I find WebCT/Blackboard easy to use.

I find it easy to get WebCT/Blackboard to do what I want it to do.

PU Perceived Usefulness of Existing Software

Using WebCT/Blackboard improves my performance as a teacher.

WebCT/Blackboard makes it easier to manage my teaching.

Using WebCT/Blackboard increases my productivity as a teacher.

Using WebCT/Blackboard enhances my teaching effectiveness.

I find WebCT/Blackboard useful as a teacher.

PEUN Perceived Ease of Use of New Software

Learning to use the features offered by Angel would take a lot of my time and effort.

It would take time and effort to “get up to speed” with Angel.

I will have to spend a lot of time and effort to learn how to set up courses on Angel.

¹ 1, 3 and 4 were dropped from the final analysis as they did not load well on the construct.

AI Adoption Intention

A semantic differential scale of 7 was used to capture the intention to adopt Angel- the new CMS.

Please indicate the probability that you would switch to Angel in Summer/Fall 2008

Unlikely – Likely

Improbable – Probable

No Chance – Certain

Age

In years (21-35, 36-50, 51-65, >65)

Teaching Load

In credit hours (3,6,9,12, 15 or more)