

Examining User Acceptance of Computer Technology: An Empirical Study of Student-Teachers in Kenya

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Abstract

The use of computer technology in schools has made slow progress even though the government has been generous in funding as evidenced in the Kenya Education Sector Support Programme (KESSP). It is therefore important to understand how and when teachers use computer technology in order to devise implementation strategies to encourage them. This study investigated student teachers' perceptions of computer technology in relation to their intention to use computers. The purpose is to shed light on more effective ways to promote the use of computer technology in schools. Based on an expanded variation of the Technology Acceptance Model, a survey of student teachers' perceptions were collected at local universities in Kenya. Overall, the results indicated that: (1) student teachers perceived usefulness of computer technology had a direct significant effect on their intention to use it; (2) student teachers perceived ease of use had only an indirect significant effect on intention to use; however, (3) student teachers' subjective norm, that is the possible influence of external expectations, did not have any direct or indirect significant effects on their intention to use computer technology.

INTRODUCTION

Recently, the pervasive influence of computer technology has made significant changes to the concept of school in Kenya. With the help of computer technology, students are now able to be more proactive in the learning process in order to achieve learning goals better. The information students gather can be individually processed, evaluated, analyzed and critically examined.

However, a recent survey has found that in comparison with the general public of the same age, teachers did not use computer technology to the same extent. Furthermore, the survey also revealed that teachers had a more skeptical and reserved attitude towards computer technology. The use of computer technology in Kenya has been a slow process since the mid-1990s even though the Kenyan government funded schools like many other developing countries in the world. It was therefore important to understand how and when teachers might use computer technology in order to devise implementation strategies to encourage them.

Several intention-based acceptance/adoption theories have been developed and empirically examined, including the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975; Davis et al. 1989); the theory of planned behaviour (TPB) (Ajzen, 1988; Taylor & Todd 1995); the technology acceptance model (TAM) (Davis et al. 1989; Venkatesh & Davis 2000); and diffusion of innovations (DOI) (Rogers, 1983; Moore & Benbasat, 1991). Among them, TAM was specifically designed to explain individual technology acceptance/adoption decisions across a wide range of organizational contexts, computer technologies, and user populations (Davis, 1986; Venkatesh & Davis, 2000). However, TAM had only two constructs and was independent of the organisational context. It had been criticized for its parsimonies. To address this constraint, effort should be made on a model extension in order to provide a richer explanation for computer technology acceptance (Legris et al. 2003).

Therefore, the objectives of this study were (1) to explore teachers' acceptance of computer technology, (2) to identify key intention determinants of computer technology use, (3) to provide practical guidelines to school administration to devise steps towards computer technology implementation; and (4) to provide practical guidelines for system designers to satisfy expectations of individual computer technology users.

LITERATURE REVIEW

Factors that affect computer technology use depend, first, on whether there are enough computers. Access to computer technology at both workplace and at home influences whether an individual user uses the technology. It is against this backdrop that there has been tremendous investment in building computer technology infrastructure in order to ensure that there are enough hardware and software resources available in institutions

of higher learning. However, the sole availability of infrastructure does not guarantee actual usage in daily routines. It is also very important to understand key motivational variables in the computer technology use of individual end users.

Attitude

Attitude has been found to be a significant determinant of behavioural intention in prior social studies (Fishbein & Ajzen, 1975; Ajzen, 1988). It has also been empirically tested as a strong mediator for motivational variables to predict behavioural intention of computer technology use (Taylor & Todd, 1995). However, as more and more key motivational determinants were found, the mediating effect of attitude towards behavioural intention to computer technology use diminished. In a recent review, it was found that nearly half of the studies being reviewed found attitude non-significant and did not include attitude in their model framework (Legris et al. 2003). It seemed that attitude was once actively used but had been excluded from more recent computer technology acceptance studies.

Subjective Norm

A subjective norm refers to an individual user's perception about opinions or suggestions of the significant referents concerning his or her behaviour (Ajzen, 1988). To put in other words, the subjective norm is the degree to which an individual perceives the demands of others on that individual's behaviour (Larsson & Lilja, 2003). Individuals can choose to perform a specific behaviour even if they are not positive towards the behaviour or its consequences. The choice depends on how important the individuals think that the important referents believe that they should act in a certain way (Fishbein & Ajzen, 1975; Venkatesh & Davis, 2000). Subjective norm was found as a strong determinant to behavioural intention, and to a wide range of social behaviours (Fishbein & Ajzen, 1975). Subjective norm has been empirically tested and has had a significant direct (Ajzen, 1988; Mathieson 1991; Taylor & Todd, 1995) or indirect effect (Venkatesh & Davis, 2000) in predicting an individual's intention to use computer technology. However, subjective norm is not consistent in predicting computer technology use intention. Some studies found that it was not significant at all (Davis, 1986). Other studies also pointed out the boundary limitation for subjective norm to be significant only in mandatory settings (Venkatesh & Davis, 2000, p. 195).

Perceived Usefulness and Perceived Ease of Use

Perceived usefulness and perceived ease of use were two other fundamental determinants in predicting an individual user's intention to use computer technology (Davies, 1989). A recent review found that these two variables received considerable attention in a great number of prior computer technology acceptance/adoption studies and were significant in both direct (perceived usefulness) and indirect (perceived ease of use) effects on intention to computer technology use (Legris et al. 2003).

Other Factors

It was also found that computer technology experience, perceived computer technology competence, loyalty and perceived culture of organizations had a direct effect on teachers' intention to computer technology use (Jedeskog, 1998; Ferndahl 2002).

Motivations and Research Questions

A review of the literature on computer technology use studies suggested that emergent factors might not be significant over time (attitude) and emergent factors might not be consistent in result significance (subjective norm). There was also doubt that the previous theoretical model (TAM) could be applied in the educational context. However, TAM could be expanded (subjective norm) to provide a richer model to predict and to explain computer technology acceptance/adoption. Therefore, the research questions of this study were (1) to explore teachers' acceptance of computer technology; and (2) to identify the key intention determinants of computer technology use.

Model and Hypotheses Development

According to our model as shown in Fig. 1, a teacher's intention to use computer technology could be predicted and explained by his or her subjective perception of computer technology usefulness and ease of use, in conjunction with his or her subjective norm.

Perceived Usefulness and Perceived Ease of Use

As shown in Fig. 1, our model used TAM for its theoretical basis (Davis et al. 1989). Specifically, perceived usefulness was defined in this study as 'a teacher's subjective probability that using computer technology would increase his or her job performance within the school context' while perceived ease of use was defined in this

study as ‘the degree to which a teacher expected computer technology to be free of effort’

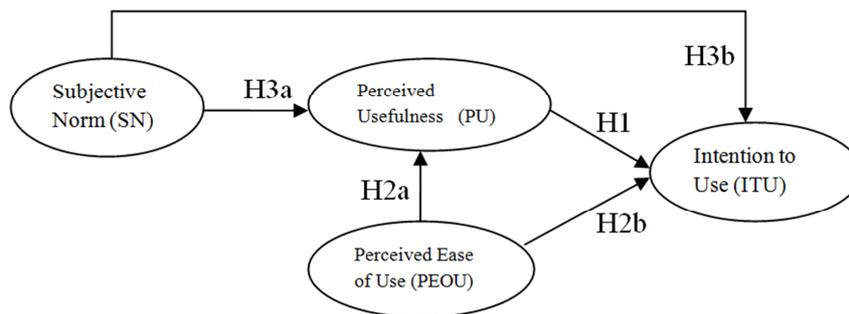


Fig. 1 Theoretical model framework

Teachers tended either to use or not to use computer technology to the extent that their subjective belief indicated it would help them perform their job better as the key agent to help students to achieve learning goals, conduct administrative duties and manage students in a class. This is so because the main duty of the teacher is to transfer knowledge to students to achieve learning goals. On the other hand, teachers also act as facilitators to help students learn by themselves through exploration or learning experiences. Teachers also keep track of students’ progress through assessment. If teachers subjectively thought that computer technology would help in performance of their job in any way, it would be a motivation for them to tend to use computer technology. This has been well supported in prior studies in other organizational contexts (Venkatesh & Davis, 2000; Mahmood & Swanberg, 2001). Therefore, we posited that,

H1: A teacher’s perceived usefulness of computer technology would directly influence his or her intention to use computer technology.

On the other hand, even if a teacher thought that computer technology was useful, he or she might at the same time believe that the system was too difficult to use and that the performance benefits of usage were outweighed by the effort of using computer technology (Davies, 1989, p. 320). A recent survey found that teachers ranked ‘a lack of computer technology competence’ as the third most major problem or barrier in the use of computer technology in their teaching role (Ferndahl, 2002). Furthermore, today, many young students seem far more skillful and competent in managing computer technology. Teachers perceived their lack of computer technology as a threat to their teaching role in the classroom (Jedeskog, 1998). It was therefore expected that teachers’ perceived ease of use of computer technology would have a direct effect on their intention to use computer technology. If teachers perceived computer technology as hard to use, it would be doubtful that computer technology could really improve their job performance. That is, it would also affect their subjective evaluation of the usefulness of computer technology. Therefore, we tested,

H2a: A teacher’s perceived ease of use of computer technology would directly influence his or her perceived usefulness of computer technology.

H2b: A teacher’s perceived ease of use of computer technology would directly influence his or her intention to use computer technology.

Subjective Norm

In this study, subjective norm refers to a teacher’s perception about opinions or suggestions of the significant referents concerning his or her acceptance of computer technology (Ajzen, 1988). Within a school setting, a teacher’s decision on computer technology use might be influenced by the opinion or suggestions of their important by other teachers. This need not be an explicit statement or order from the administration of the school. The focus of the measurement was to examine how a teacher subjectively evaluated the thought of important others in their decision process.

On the one hand, within the school setting, as it is not a profit making organization in nature, there is no direct competition for resources or promotion among peers. Teaching, to a certain extent, is a long-term commitment career. The social circle in teaching is quite close. All the above factors favour the view that teachers work in a cooperative and close social circle in which strong influence exists among peers. However, in fact, the teaching profession has a flat organisational structure. There is a principal and a few administrative positions. All the others are classroom teachers, with high autonomy in their teaching duties. Within a classroom, or even after class, teachers make decisions on most of their teaching tasks. Although they might be influenced by their peers, teachers are quite independent. The teaching experience also affects their behaviour as the more teaching experience is gained, the more the teacher might have a stronger and independent standpoint. Prior studies also found inconsistent results of subjective norm towards computer technology acceptance/adoption (Venkatesh & Davis 2000). Both standpoints have their merits. In this study, we were inclined to the standpoint that teachers were close and would be influenced by the thinking of other teachers both in making their decisions

regarding computer technology acceptance, and in evaluating computer technology as being useful. Therefore, we posited that

H3a: A teacher's subjective norm to computer technology use would directly influence his or her perceived usefulness of computer technology.

H3b: A teacher's subjective norm to computer technology use would directly influence his or her intention to computer technology use.

METHODOLOGY

Subjects

In order to test the model, we proportionately gathered data from 84 third year student-teachers in teacher education programme at Masinde Muliro University of Science & Technology, Maseno University and Moi University in Kenya. We selected student-teachers because (1) the majority of the graduates would be practicing teachers (2) the education programme agitates for training in computer technology and the student-teachers would be able to utilize computer technology when they became practicing teachers and (3) student-teachers studied full time but they were to practice teaching in schools. Therefore, student-teachers would be a good proxy to practicing teachers and would be a good measure of future teachers' opinion.

Among the 84 respondents, 33.5% were male while 66.5% were female. The ages ranged from 19 to 30 (34%), from 31 to 40 (40%) and over 41 (26%). The respondents were of different majors, including student teachers who specialized in mathematics, and Sciences. (21%), (3) education arts: student teachers who had other major subject areas (18%) and (4) education: student teachers who studied technology as their specialty (28%). Almost everyone had access to a computer at home (96.6%) and 86.2% had Internet connection. They reported weekly computer usage as 0–2 hrs (10%), 3–5 hrs (21%), 6–10 hrs (31%) and over 10 hrs (38%).

Method

A survey instrument was introduced to all the student teachers. Eighty four (78.5%) completed questionnaires were collected. The instrument was composed of 24 statements on perceived usefulness (PU) (seven items), perceived ease of use (PEOU) (seven items), subjective norm (SN) (six items) and behavioural intention to computer technology (ITU) (four items), asking respondents to identify their opinion of each statement on a seven-point Likert scale, ranging from 1 – strongly disagree to 7 – strongly agree. In a further analysis validity check, five items were cross-loaded and were removed.

Data Analysis

Descriptive Statistics and Validity of Instrument

The means, standard deviations, Cronbach's α values and factor loadings were calculated. The means were all over 4, ranging from 4.31 to 5.44, except for the subjective norm in which three out of the five items were below 4, ranging from 3.46 to 3.63. The validity of the instrument was examined in terms of internal consistency (reliability) and convergent and discriminant validity (Straub, 1989). Internal consistency was examined using Cronbach's α values. All the constructs exhibited a values greater than 0.85, significantly higher than the threshold value of 0.8 (Nunnally & Bernstein, 1994). This shows that all the constructs exhibited a high internal consistency with their corresponding measurement indicators. Convergent and discriminant validities were examined by construct items' factor loadings. By using principal component analysis of Varimax with Kaiser Normalization rotation, the factor loadings of each item and their corresponding components were found. The four constructs exhibited both convergent validity (high factor loadings among items of the same component) and discriminant validity (low factor loadings across components). The total variance explained by the four components was 75.14%.

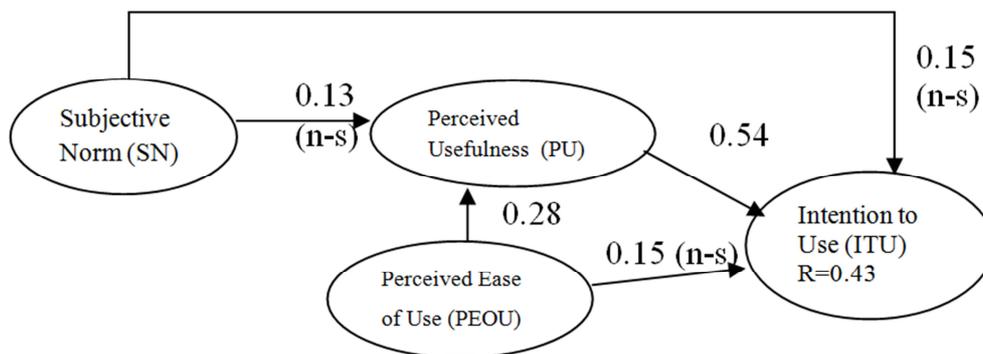


Fig. 2 Structural equation modeling testing results.

Model Testing Results

The model testing results are shown in Fig. 2.

It was found that perceived usefulness significantly influenced intention to computer technology use ($b=0.54$, $P<0.001$), supporting hypothesis H1. Perceived ease of use was found to have significantly affected perceived usefulness ($b=0.28$, $P<0.05$), supporting hypothesis H2a. However, perceived ease of use was found non-significant towards intention to computer technology use, showing that perceived usefulness was a full mediator between perceived ease of use and intention to computer technology use. Therefore, H2b was not supported. Furthermore, subjective norm was found non-significant toward both perceived usefulness and intention to computer technology use, supporting neither hypothesis H3a nor H3b.

The model had two dependent variables, intention to computer technology use and perceived usefulness. Perceived usefulness was found to be significantly determined by perceived ease of use, resulting in an R^2 of 0.11. That is, perceived ease of use explained 11% of the variance of perceived usefulness. Intention to computer technology use was found to be jointly determined by the indirect effect of perceived ease of use and the direct effect of perceived usefulness resulting in an R^2 of 0.43. That is, the joint effect explained 43% of variance of intention to computer technology use. Hypotheses testing results are summarized in Table 1.

Table 1. Hypotheses testing results

Hypotheses	Path	Path coefficient	Results
H1	PU → ITU	0.54	Supported
H2a	PEOU → PU	0.28	Supported
H2b	PEOU → ITU	0.15 (n-s)	Not Supported
H3a	SN → PU	0.13 (n-s)	Not Supported
H3b	SN → ITU	0.15 (n-s)	Not Supported

DISCUSSION

Key Findings

The research objectives of this study were (1) to explore teachers' acceptance of computer technology and (2) to identify the key intention determinants of computer technology use. It was found that teachers' perceived usefulness and perceived ease of use were two key intention determinants of their computer technology use. Teachers' perceived usefulness had a direct significant effect on their intention towards computer technology use. Teachers' perceived ease of use had an indirect significant effect on their intention to computer technology use, fully mediated by perceived usefulness. However, teachers' subjective norm did not have any direct or indirect significant effect on their intention towards computer technology use.

Contributions to Research

Effects of Perceived Usefulness on Intention to Computer Technology Use

The results of this study found that teachers' perceived usefulness was significant and strong in determining intention to computer technology use. This finding is comparable with prior studies in other organisational contexts and technologies (Mahmood & Swanberg, 2001; Legris et al. 2003). This can be explained by the fact that teachers find computer technology useful in improving their instructional performance, and motivating their intention to use computer technology in the future. The current study found that teachers who viewed computer technology as useful appeared to demonstrate an acceptance of computer technology and perceived their own role as evolving into guiding more teachers in the school in the or of the future.

Effects of perceived ease of use effects on perceived usefulness and intention to computer technology use. This study found that teachers' perceived ease of use did not have any significant effect on their intention to use computer technology. This empirical finding is supported in spite of the mixed results in prior studies (Davis et al. 1989; Subramanian 1994) in other organisational contexts and technologies under investigation. The logical relationship between these findings is that teachers would not have a higher intention to computer technology use, solely because computer technology was easy to use. But, if computer technology was perceived as easy to use, it would be perceived as more useful. A teacher restated this as, 'If I did not know how to use computer technology, it would be useless to me'!

Subjective Norm

This study first showed that the means of the indicators of teachers' subjective norm ranged from 3.46 to 4.36 on a seven-point Likert scale. The low mean values implied that teachers did not perceive that their own behaviour would be highly affected by their important referents. In the model testing analysis, it was found that teachers' subjective norm did not have significant effects on their perceived usefulness and their intention to use computer technology. One explanation could be as Jedeskog (1998) suggested that it was the individual teacher who decided when computer technology became part of the curriculum. A teacher could work quite independently in

a classroom, with little interference from the school administration. Prior studies supported this argument as they (e.g., Venkatesh & Davis 2000) empirically found that subjective norm had significant effect on intention to use in a mandatory setting, while it had no effect in a voluntary setting. The results of this study add empirical support to the study of computer technology acceptance/adoption in the literature.

Contributions to Practice

In the classroom, it is the teacher who decides when computer technology is appropriate in the curriculum. Within the classroom environment, when to use and how to use computer technology has to be guided by individual teachers. Teachers' intention to use computer technology is critical to the success of the utilization and implementation of computer technology. Supported by prior studies, this study empirically found that teachers' perceived usefulness had direct significant effects on their intention to computer technology use while teachers' perceived ease of use had indirect significant effects on their intention to computer technology use fully mediated by their perceived usefulness on computer technology. Therefore, school administrations should devise implementation strategies to demonstrate how computer technology could improve instructional performance. For example, through best practices, administrators could showcase how learning goals could be more efficiently and effectively achieved through computer technology.

On the other hand, teachers need the necessary knowledge and competence in order to use computer technology effectively. Encouragingly, more than half of all teachers in Kenya are aware of the need and government emphasis on technology use in the current world. This could be a good start. Despite this, teachers' computer technology knowledge and competence generally seems a serious problem. This could be a critical factor explaining why teachers perceive they have low computer technology knowledge and competence and also explaining the low ranking of computer technology knowledge and competence as one of the most determining factors in their intention to use computer technology. This could also partly explain why the use of computer technology in schools has been a slow process. Effective training, teachers' computer technology experience and teachers' perceived computer competence would all affect teachers' perceived ease of use of computer technology. This would most probably be one of the top priorities that school administrators/management need to tackle in the future.

Limitations and Future Research

There were several limitations in this study that should be taken into consideration before the findings can be generalised. Firstly, student teachers were the subjects in this study. Although the majority of these student-teachers would eventually be teachers and they also had practice experience in schools, their opinion would not be the same as practicing teachers. Yet, they serve as a good proxy and can help us project and understand the opinion of future teachers. However, the findings might not apply fully to practicing teachers. Future research could be designed to collect data from practicing teachers and compare the results. Furthermore, the opinion of these student-teachers may have been affected by the operation of the schools where they did their teaching practice. There were some schools that allowed teachers full autonomy to decide their own teaching and their use of instructional instruments, while other schools were more prescriptive in school operations. Mandatory versus voluntary settings for computer technology use would probably provide different views of our understanding of the phenomenon. It would also be more fruitful for future research to consider collecting data from different school settings to compare the differences in empirical findings.

CONCLUSION

This study attempted to explore teachers' computer technology acceptance/adoption and found that perceived usefulness and perceived ease of use were two determinants to teachers' computer technology use. In spite of the fact that these two determinants seem obvious, an in-depth analysis found that problems related to these two key factors have existed for a long time without effectively being tackled. The findings, the discussions and the implications of this study were definitely important to the study and implementation of computer technology in an educational context.

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