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Pre-service teachers' attitude towards information and communication technology usage: A Ghanaian survey

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ABSTRACT

This study employed the Technology Acceptance Model (TAM) to empirically investigate factors that influence Ghanaian pre-service teachers' attitudes towards Information and Communication Technology (ICT) usage. To achieve this aim, the study extended the TAM framework by adding leadership support and job relevance as exogenous variables. Data were randomly collected from 380 pre-service teachers studying a 3-year Diploma in Education programme in Ghana. Based on a multiple stepwise regression analysis, the findings suggested the following: (1) leadership support significantly influenced perceived ease of use; (2) job relevance significantly influenced perceived usefulness; (3) perceived usefulness significantly influenced attitude towards use; (4) perceived ease of use significantly influenced attitude towards use (5) the TAM is significant for pre-service teacher education context except the relationship between perceived ease of use and perceived usefulness. The study contributed to the literature by validating the TAM in the pre-service teacher education context in Ghana. It also provided several implications for the research and practice of ICT adoption in the developing world context.

Keywords: attitude, pre-service teacher, information and communication technology, regression analysis

INTRODUCTION

In the last three decades, governments and policy-makers around the globe have made enormous investments in Information and Communication Technology (ICT) in their educational systems in order to remain competitive in the global knowledge economy (Ministry of Education, Ghana (MOEG**)** 2015; Lim**,** Chai & Churchill, 2011; Steketee, 2006; Teo, 2008). However, a number of them has been underutilised or abandoned completely due to limited user acceptance and adoption (Park, 2009; Teo, 2009). Given the high rate of failure of ICT initiatives intended for effective teaching and learning in education, particularly in the developing world, a solid understanding of the determinants of user acceptance of particular technology is crucial not only for theory building but also for practical effectiveness (Park, Roman, Lee & Chung, 2009). Although contended by some few researchers (Teo & Schalk, 2008; Venkatesh, et al., 2003), pre-service teachers' attitude towards ICT usage have been widely recognized as a key determinant of technology acceptance and its subsequent integration in any education system (Al-Rabaani, 2008; Hernández-Ramos, et al., 2014). As such, at a time of substantial levels of investment in ICT in Ghanaian schools **(**Asabere & Enguah, 2012; MOEG, 2015), this study adopts the widely tested TAM to empirically investigate factors that influence Ghanaian pre-service teachers' attitudes towards ICT in teaching and learning. This study is timely and relevant because it focuses on pre-service teachers attitude towards the use of ICT for pedagogical purpose, a topic considered to be critical for meeting the needs of educational development in Ghana (MOEG, 2015) and internationally (Lim et al., 2011). A better understanding of the pre-service teachers' attitudes towards the use of the technology can provide essential information for curriculum designers in supporting this new innovation and for policy-makers who are setting new directions for ICT policy.

ICT IN GHANAIAN EDUCATION CONTEXT

Ghana is one of the most developed and economically stable country in West Africa sub-region. The growing economic prosperity coupled with Ghana's democratic political dispensation has made the country a regional power in the West African sub region. With its current Gross Domestic Product (GDP) of US$ 38.65 billion, Ghana achieved Lower Middle-Income status in 2010 (World Bank, 2014). The country is also one of the African countries in which the importance of ICT is growing fast. One area, in which the influence of ICT in Ghanaian society is visible, is education (MOEG, 2015). The Ghanaian government has for the past two decades invested enormously in ICT in education with the aim to equip students to meet the challenges and demands in the 21st century knowledge economy (Gaisie-Nketia, 2008; MOEG, 2015). For example, in 2008, the government of Ghana dedicated US$3 million to promote ICT in Basic Education (Gaisie-Nketia, 2008) and as at August 2015, it was reported that the government had distributed over 450, 000 laptops to schools, especially, those in the deprived areas (Myjoyonline,31st March 2016). In the same vein, a survey conducted by the MOEG in 2009 in 501 second cycle institutions showed that 494 (98.5%) of them had computers whilst only 7(1.4%) did not have. The survey further indicated that 87% of the schools had computer laboratories whilst 94.7% had ICT teachers (Ministry of Education Statistics, 2009). In the pre-service teacher education context, although no available statistics existed to show the number of computers in the various Colleges of Education, evidence show that there is no single College of Education in Ghana that has no, at least, one ICT laboratory. Even more important, most of the institutions that are connected to the Internet are also found to have their own websites (Owusu, et el., 2010).

However, a survey by Pome (2015) found that although ICT is available in most schools, particularly, in the urban areas, teachers are not using the technology for pedagogical purposes. One major factor identified by the researcher was the teachers' negative attitudes towards the technology for instructional purpose. Considering the pivotal role pre-service teachers are expected to fulfil in the process of integrating ICT in the Ghanaian classroom context (Asabere & Enguah, 2012; Lim, et al., 2011) the success of student learning with ICT will largely depend on the attitude of pre-service teachers, and their willingness to embrace the technology (Teo, 2006). Therefore, at a time of substantial spending on ICT in education by the Ghanaian government, understanding of how they react to the technology is essential for its successful implementation.

LITERATURE REVIEW

Globally, investment in ICT in education to improve teaching and learning has been well-documented over the last three decades. Because of these substantial expenditures for new technologies in education, pre-service teacher education institutions are under pressure to prepare the prospective teachers to integrate these tools into the curriculum **(**Lim, Chan & Churchill, 2011). However, some research studies have shown that teachers are not using the technology for instructional purpose (Lim, Chai & Churchill, 2011; Lock, 2007). In particular, research provides strong evidence that the successful pedagogical use of ICT depends on teachers' attitudes and acceptance towards technology (Hernández-Ramos, 2014; Luan & Teo, 2009; Teo, 2008). Goktas, Yildirim & Yildirim (2009) posited that teachers gain much needed skills and develop attitudes toward ICT usage during their pre-service teacher education programmes. This suggests that pre-service teacher education institutions play a pivotal role in changing teachers' attitude. Therefore, as Ghanaian pre-service teachers will begin their duties as teachers in the near future, their attitudes towards ICT usage for instructional purpose should be determined during their teacher training programmes.

Ajzen & Fishbein (2000) defined attitude as a person's predisposition to respond favourably or unfavourably to an object or event. In this study, it is about the Ghanaian pre-service teachers

responding favourably or unfavourably to ICT usage for instructional purpose. Despite the earlier criticism that attitude has no significant influence on actual ICT use (Teo & Schalk 2009), a number of prominent researchers have pointed out that pre-service teacher's attitude is a strong factor in determining their ICT usage (Davis, 2009; Hernández-Ramos, 2014; Teo, 2010). For example, Huang & Law (2005) contended that irrespective of the quality and sophistication of technology infrastructure in any educational institution, the extent to which it is adopted greatly depends on teachers having positive attitudes towards it.

Similarly, a study by Kersaint, Horton, Stohl, & Garofalo (2003) found that pre-service teachers who showed positive attitudes towards ICT felt more comfortable with using ICT, and more inclined to integrate it into their teaching. In another study in Singapore's pre-service teacher educational context, Teo (2009) concluded that negative attitudes towards ICT was a deterrent to using by the pre-service teachers in the learning environment. The implications of the findings from these studies are that, searching for factors that might best facilitate change in pre-service teachers' attitudes at the initial stages of ICT adoption should not be overlooked.

Knezek and Christensen (2002) in their analysis of several major cross-cultural studies surprisingly gave prominence to teachers' attitudes over ICT skills, which most studies have reported as a pre-requisite for ICT usage (Steketee, 2005**;** Unwin, 2006). They were of the view that pre-service teachers go through the process of ICT integration through a set of well-defined stages, which requires first, the users developing positive attitudes rather than acquisition of skills of the technology itself. It is, therefore, not surprising that some researchers such as Huang & Liaw (2005) and Myers & Halpin (2002) postulated that studying teachers' attitudes should not be underestimated since it is a major predictor of their future classroom use of the technology. However, other researchers such as Gotkas, Yildirim & Yildirim, 2009 had disputed this assertion arguing that having a positive attitude towards ICT is not sufficient by itself to achieve effective and meaningful integration of ICT into classroom environment. Other important factors such as beliefs, self-confidence, technology knowledge, schools' culture, access and leadership support play a pivotal role.

THEORETICAL UNDERPINNINGS OF THE STUDY

Since the 1980s researchers have propounded a number of theories and models in an attempt to explore and explain factors that cause users to accept, reject or continue the use of ICT for instructional purpose in educational settings. A few of the most widely recognised ones include Diffusion of Innovation (Rogers, 2003), The Unified Theory of Acceptance and Use of Technology (UTAUT (Venkatesh et al., 2003), Apple Classrooms of Tomorrow (ACOT) (Sandholtz, et al., 1997), Technology Acceptance Model (TAM) (Davis, 1989) and the Theory of Reasoned Action (TRA) (Fishbein & Ajzen 1975). Taken its roots from the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), and propounded by Davis (1989), the TAM has been widely recognised as a highly reliable, valid and robust predictable model that can be adapted in various contexts and fields including Higher education (Afari-Kuma & Achampong, 2013), pre-service teacher education (Aypay et al. 2012), e-learning (Yuen & Ma, 2008) and several other fields (Al-Somali, Ghalami & Clegg, 2009). More importantly, the TAM has been found to possess a predictive validity in studies whose participants are pre-service teachers (Kiraz & Ozddemir, 2006; Ma, Anderson & Streith, 2005). Based on the above reasons, the TAM was chosen over other equally important theoretical models mentioned above as the main theory to guide the study.

The Technology Acceptance Model

The TAM postulates that, when users are presented with a new technology, many factors influence their initial acceptance but two key factors, perceived usefulness (PU) and perceived ease of use

(PEU) play a significant role in their continued acceptance and adoption (Davis, 1989). Davis (1989) was of the view that when technology is perceived to be useful and easy to use, these perceptions results in positive attitude towards the acceptance and use of the technology. This suggests that, users attitude towards ICT is determined by the joint influence of perceived benefits of the technology and perceived efforts required by them to use the technology. Davis (1989:320) defined perceived usefulness (PU) as "the degree to which a person believes that using a particular system will enhance his or her performance," whilst perceived ease of use (PEU) referred to "the degree to which a person believes that using a system would be free from effort. Perceived usefulness is found to be the strongest factor influencing adoption whilst perceived ease of use to be a direct determinant of perceived usefulness (Davis et al., 1989:997). This means that, the less effort a system requires, then the more that using it can increase job performance. On the other hand, perceived usefulness has been found to have a significant influence on attitude towards use (ATU) and intention to use (Teo, 2009). ATU refers to as the evaluative effect of negative or positive feeling of the individual in performing a particular behaviour (Ajzen & Fishbein, 2000) and has been identified as a factor that guides future behaviour. Together, PU and ATU constitute a significant influence on Behavioural Intention to Use (BIU), which in turn affect the Actual System Use (see, Figure, 1).

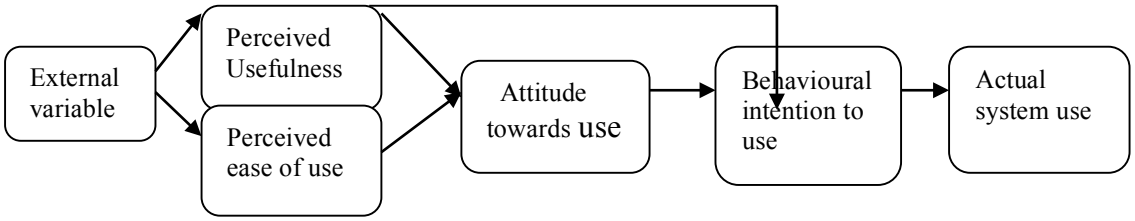

Figure 1 *Technology Acceptance Model (Davis, 1989:320).*

While the TAM is considered by many researchers to be a robust and parsimonious theory of technology acceptance (Al-Somali, Ghalami & Clegg, 2009; Teo, 2009), the theory is not without criticisms. Chuttur (2009) criticised the framework as relying on self-reported data. While helpful, Chuttur contended that self-report data can be problematic as the participants may misreport their attitudes, their beliefs and the scope of their technology use. Some other pertinent observed limitations pointed out by the users of the model included the model's failure to determine barriers that hinders technology acceptance and its simplicity which had led to its over-use at the expense of other useful models (Tibenderance, et al., 2010; Taylor & Todd, 2001). Even when taking into account the criticisms, however, the TAM has been widely adopted in many empirical studies and the tools used proven to be of higher quality as it yields statistically reliable results (Shroff, Deneen & Ng, 2011).

Until recently, the vast majority of the TAM research had concentrated in the developed world (Persico, Manca & Pozzi, 2014) but with the current proliferation of ICT in education globally, the need to carry out research studies based on the TAM in the developing world has received maximum attention (Al-Somali, Ghalami & Clegg, 2009). For example, in the last three decades, there has been a number of research studies based on the TAM in the Middle East and Asian countries (Aypay et al., 2012; Teo, 2009; Teo, Wong et al., 2013). In Asia, particularly in Singapore and Malaysia, there have been myriads of the TAM studies (Teo, 2009; Teo 2008; Wong et al., 2013). For example, in Singapore, a survey of 139 pre-service teachers by Teo (2008) found that pre-service teachers' attitudes and intentions to use computers were more positive than their perceived ease of use and usefulness. Teo's survey finding was inconsistent with the original TAM which found perceived usefulness to be the strongest factor influencing adoption (Davis, 1989). A

similar study by Wong et al. (2013) in Malaysia supported the above findings by validating the TAM in the Malaysian pre-service teacher education context. These studies refute earlier assertion that TAM model belongs to only the advanced countries.

While studies based on the TAM abounds recently in regions such as Middle East and Asian-Pacific regions, unfortunately, the model has not been used extensively and tested in Africa, (Al-Somali, Ghalami & Clegg, 2009; Anamoah-Mensah, 2011; Anandarajan, et al., 2002). Although the original TAM model has been used in few educational contexts in Africa (e.g. Mtebe Raisano, 2014; Gyaase, Anokye-Sarfo & Bediako, 2013; Teo, 2009), a search of literature in journals such as International Journal of Education and Development using Information and Communication Technology, African Journal of Information and Communication Technology, Science Direct and others revealed that currently, it has not yet been tested and validated in the Ghanaian pre-service educational context particularly in the Colleges of Education settings which is the focus of this study. However, there have been some few studies based on the TAM in the Ghanaian higher education especially in the universities (Afari-Kumah & Achampong 2010) and second-cycle (Buabeng-Andoh & Yidana, 2015) educational contexts. Accordingly, the present study is the first research based on the TAM to examine pre-service teachers' attitude towards ICT in the Ghanaian pre-service teacher educational context.

EXTENDED TAM FRAMEWORK

This study extended the TAM by adding job relevance and leadership support as a composite model to empirically investigate Ghanaian pre-service teachers' attitude towards ICT. The direct and indirect effects of each construct constituted the hypotheses (Figure 2) and were tested through empirical data.

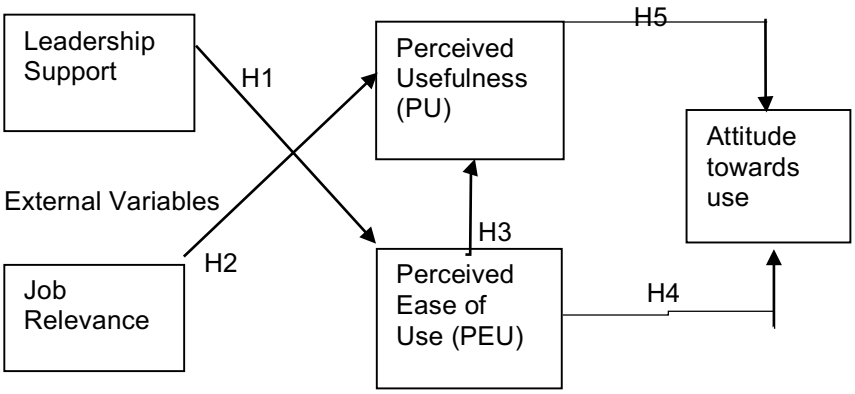

Figure 2. *Extended Technology Acceptance Model*

Based on the literature review and the extended theoretical components of the TAM, the researcher formulated the following hypotheses:

Leadership support

Hayes and Harriman (2001:5) confirmed that the most important factor influencing the success of technology integration "was the involvement and support of the principals." However, a study by Zuberviel (2012) in Ghana found that school leadership are not supportive of teachers' ICT integration in schools. In the context of this study, leadership support is defined as the pre-service

teachers' perception of the degree to which leadership understands the importance of ICT and the extent to which the top management is involved in its implementation of ICT. Strong commitment from leadership is critical to ensuring ICT adoption by creating a supportive context for ICT use within the institution (Flanagan & Jacobson, 2003).

Hypothesis 1. Leadership support has a significant effect on perceived ease of use of ICT by the pre-service teachers.

Job Relevance

Job relevance refers to the extent to which a pre-service teacher considers ICT to be applicable to his or her job. It widely recognised that when individual users perceive ICT as being relevant to their job, they will be inclined to accept it (Acarli & Saglam, 2015; Venkatesh & Davis, 2000). On the other hand, when the individual users perceive ICT as irrelevant to their job, they will be less likely to accept it. In this study it is hypothesised that:

Hypothesis 2. The degree to which ICT is perceived to be relevant to a pre-service teacher's future job has a positive effect on usefulness of the technology.

Perceived Ease of Use

Perceived ease of use has been found to have a direct impact on perceived usefulness and the attitude towards usage (Teo, 2011; Wong & Teo, 2009; Davis et al. 1989). Moreover, Wong & Teo (2009) found that perceived ease of use was a significant determinant of the attitude and intention to use technology among student teachers. This finding has been confirmed by recent studies (Sumak et al., 2011; Teo, 2011). Sumak et al. (2011) for example, found that perceived ease of use directly affects pre-service teachers' attitude towards ICT. With this in mind, the following hypotheses were tested.

Hypothesis 3. Perceived ease of use significant impact on pre-service teachers' perceived usefulness.

Hypothesis 4. Perceived ease of use has positive influence pre-service teachers' attitude towards ICT usage.

Perceived Usefulness

Several research studies suggest that pre-service teachers tend to use ICT when they believe that it will enhance their future job performance in the classroom (Teo, 2009; Teo & Schaik, 2009). This suggests that pre-service teachers would tend to utilize ICT when they found it to be useful in performing their educational tasks.

Hypothesis 5. Perceived usefulness has significant impact on pre-service teachers' attitudes towards ICT usage.

METHODOLOGY

A quantitative cross-sectional survey design aimed at providing data useful for the testing the proposed hypotheses was employed. The participants for this study consisted of 400 pre-service teachers from two Ghanaian publicly-owned Colleges of Education who were undertaking a 3-year Diploma in Basic Education. In order to give all the respondents an equal opportunity for being selected (Schumacher, 2014), a random sampling strategy was adopted to select the respondents.

This was achieved through the following process: Numbers (1-100) written on pieces of papers were prepared and put into a box and mixed up thoroughly. The students were asked to pick them one by one randomly during lectures with permission from the tutors. Those who randomly picked the odd numbers were selected to complete the questionnaires while those with even numbers deemed not eligible to participate. The process was repeated until the required number (200) was achieved on each site. Out 400 respondents 380 returned their questionnaires, giving response rate of 95%. Before administering the questionnaires the purpose and the right of all the respondents not to take part of the study during or after the study were explained. On average, each respondent took not more than 40 minutes to complete the questionnaire. The survey took place between January and May 2016.

Measurement

The researcher adopted measurement validated by prior research studies (Acarli, 2015; Luan & Teo, 2009; Hayes et al., 2001; Venkatesh, 2000) with wordings revised for the target respondents and technology context. Apart from the demographic profile, the respondents responded to 17 statements on job relevance (JR) (3 items), leadership support (LS) (2 items), perceived usefulness (PU) (4 items), perceived ease of use (PEU) (4 items) and attitude towards use (ATU) (4 items). The items were rated on five-point Likert scale ranging from 1- strongly disagree to 5 – strongly agree with their sources of reference (See the Appendix).

DATA ANALYSIS

The data was analysed by employing IBM SPSS Statistical 21 software for descriptive and inferential analyses of the study. The total number of valid survey was 380 out of 400 pre-service teachers from the two colleges, yielding a 95% response rate. Majority of the respondents' age varied between 19 and 25 consisting 51% females and 49% males. Only 6% fall within ages 25 and 30 and none above 30 years. This implies that 94% of the respondents were below 25 years.The ages of the overall majority fall within what Prensky (2001) describes as the digital natives. This suggests that the majority of the current cohorts of the pre-service teachers in Ghana were born within the digital era.

In order to scale down the large set of the variables in this study to a smaller but more manageable size while retaining as much of the original information as possible (Field, 2013), an exploratory factor analysis was use. The appropriateness of factor analysis was achieved by Kaiser-Meyer-Olkin (KMO) value of .635 (Kaiser, 1974) and Bartlett's test of sphericity (Bartlett, 1950) which reached the statistical significance (P=.000).

Internal Consistency

Table 1. *Cronbach's Alpha's Results*

Scale		Cronbach's Alpha (α)	No of items
Attitude towards use	(ATU)	.088	4
Perceived usefulness	(PU)	.085	4
Perceived ease of use	(PEU)	.085	4
Leadership support	(LS)	.084	2
Job relevance	(JR)	.089	2

The internal consistency was tested to show the strength of the model. Based on the recommended threshold set DeVellis (2012) that, ideally, the Cronbach alpha coefficient of a scale should be .07 and above. Table 1 shows that all the constructs used showed alpha values greater than .07.

After conducting the factor analysis to condense the variables to a manageable size, testing the internal consistency, stepwise multiple regression analyses were conducted to test the proposed hypotheses.

HYPOTHESES TESTING

A series of stepwise multiple regression analysis was employed to test the hypotheses. With the exception of Table 2 each analysis was between a group of independent variables and a single dependant variable. For each construct, a factor loading's average of its related items was used. Stepwise multiple regression analysis was adopted as it adds predictor variables item that best correlates with the independent variable item are used. Whilst the items that least correlate are subtracted automatically by the stepwise regression method. This helps the researcher to generate a regression equation using only the predictor variables that make a significant contribution to the prediction (Hinton, McMurray & Brownlow, 2014). Following a standard practice in the Social Sciences research (Creswell, 2014) a statistical significant level of 0.05 (5%) was adopted as a benchmark to accept or reject a null hypothesis.

***Table 2**. Influence of LS on PEU*

Model	Unstandardized Coefficients		Standardised Coefficients	t	Sig
	B	Std. Error	Beta		
LS	.057	.020	.132	2.822	.005

a. Dependent Variable: Perceived Ease of Use (PEU)
b. Independent Variable: (Constant), Leadership Support (LS)

Table 2 depicted the multiple regression results for leadership support's (LS) influence on perceived usefulness (PU) of pre-service teachers' attitude towards ICT use (ATU). The results showed that leadership support (LS) ($\beta = .132$, $P < .005$) had direct impact on pre-service teachers' perceived ease of use of ICT, supporting Hypothesis 1.

***Table 3.** Influence of JR and PEU on PU*

Model	Unstandardized Coefficients		Standardised Coefficients	t	Sig
	B	Std. Error	Beta		
J R	.095	.043	.114	2.226	.027
PEU	.075	.034	.101	1.922	.056

a. Dependent Variable: perceived usefulness (PU)
b. Independent Variables (constant) job relevance (JR), perceived ease of use (PEU)

Table 3 showed surprising results. Whilst job relevance (JR) was found to influence perceive ease of use (PEU) ($\beta = .114$, $P < .027$), Contrary to the expectations, the stepwise regression analysis

showed that the relationship between Perceived Ease of Use (PEU) and Perceived Usefulness (PU) (β=.101, P<.056) was insignificant. Therefore, hypothesis three (H: 3) was not supported. This result contradicted the original TAM (Davis, 1989) that PEU has positive influence on PU.

As the ultimate objective of this study was to investigate pre-service teachers' attitude towards the use of ICT, the final aspect of the stepwise multiple regression analysis was to verify the influence of pre-service teachers' perceived ease of use and perceived usefulness on their attitudes towards the use of ICT (ATU) in their future classrooms.

Table 4. *Influence of PEU and PU on ATU*

Model	Unstandardized Coefficients		Standardised Coefficients	t	Sig
	B	Std. Error	Beta		
PEU	.047	.024	.101	1.993	.047
PU	.072	.031	.118	2.318	.025

a. Dependent Variable: attitude towards use (ATU)
b. Independent Variable: (Constant), perceived ease of use (PEU), perceived usefulness (PU).

Consistent with the findings of major TAM studies (Teo, 2009; Hu, et al., 1999), the proposed model of this study demonstrated that attitude towards use (ATU) is significantly influenced by both perceived ease of use (PEU) (β = .101, P < .047) and perceived usefulness (PU) (β = 118, P < .025). Consequently, hypotheses 4 and 5 were supported. However, the data from Table 4 showed that PU has a stronger influence on pre-service teachers' attitude towards ICT usage than PEU. Overall, the original TAM constructs (PEU and PU) were found to have significant positive influence on the attitude towards ICT usage. The data from Table 4 indicated that exogenous constructs such as JR and LS and the two key TAM endogenous constructs (PU and PEU) are all critical factors determining pre-service teachers' attitude towards ICT use in their future classrooms.

Hypotheses Testing Summary

Based on the multiple step-wise regression analyses, the table below shows the summary of the hypotheses testing results.

Table 5. *Hypotheses Summary*

Hypothesis (H)	Path	Hypothesis	Results
H1	LS ⟹ PEU	P < .005	Supported
H2	JR ⟹ PU	P < .027	Supported
H3	PEU ⟹ PU	P >. 05	Not Supported
H4	PEU ⟹ ATU	P < .047	Supported
H5	PU ⟹ ATU	P < .025	Supported

N=380, Significance level at 0.05 (5%) confidence level

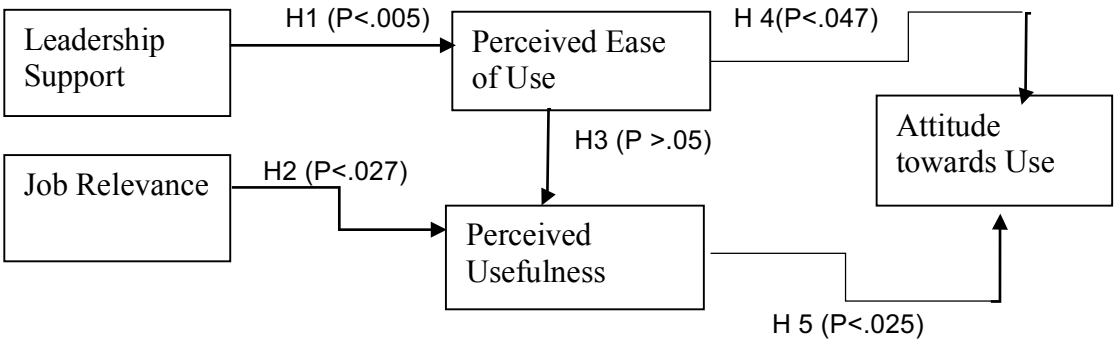

Figure 3. *Summary of Hypotheses*

DISCUSSION

This survey employed the TAM to empirically investigate factors that influence Ghanaian pre-service teachers' attitudes towards ICT usage. To achieve this aim, the TAM was extended to include two exogenous constructs, namely leadership support and job relevance. Overall, 4 out of the 5 hypotheses were positively significant. With the exception of hypotheses 3, all the rest of the hypotheses both exogenous variables (H1 and H2) and endogenous variables (H4 and H5) were supported. The study found that perceived usefulness and perceived ease of use had direct influence on the pre-service teachers' attitude towards ICT usage. However, the more dominant determinant of the pre-service teachers' attitude towards ICT was perceived usefulness (β = .118, P < .025) compare with PEU (β= .101, P<.047), This finding is consistent with Anderson & Maninger (2007) who postulated that, when new technology is presented to teachers, they make value judgement as to whether the new technology will be beneficial to perform their job better than used to be. This seemed to suggest that perceived usefulness is extremely important and therefore, the pre-service teachers have predicted the adoption of ICT in teaching and learning as the best solution to their identifiable problems such as lack of access to teaching and learning materials and several others.

Perhaps, the most interesting findings from the study were the relationships that were insignificant. Contrary to the major TAM research studies (Shroff et al. 2011, Davis, 1989) while perceived ease of use had a significant positive effect on attitudes towards use, surprisingly, it had no significant influence on perceived usefulness. This interesting result contradicted the major TAM research studies (Sumak, et. al., 2011; Luan & Teo, 2009; Davis, 1989) that perceived ease of use is a dominant factor in explaining perceived usefulness. A plausible reason for the lack of support for hypothesis 3 could be that the pre-service teachers may not see ease of use as a significant determinant of ICT use since they belong to the generation of digital natives (Prensky, 2001). For example, an overwhelming 94% of the respondents were below 25 years, suggesting they mostly fell within the age range about which claims are being made in educational debates concerning the 'digital natives' and 'net generations' (Prensky, 2001 & Tapscott (1998). These generations were born within the digital era and therefore, unlike their predecessors are more likely to be conversant with the use of the technology. Therefore, they may develop positive attitudes towards the technology primarily because of the functionality offered. This implied that the pre-service teachers gave a priority on usefulness over ease of use of ICT despite the fact that, the literature showed that ease of use is the pre-requisite for ICT to be useful (Davis, et al., 1989) otherwise user might not use it appropriately. Since ICT has been in the Ghanaian education system for over a decade

(Buabeng-Andoh & Yidana 2015), the pre-service teachers might also have been relatively conversant with the advanced and complex technologies for personal and perhaps for teaching purposes and preferred to be challenged when using ICT for teaching and learning purposes. In the same vein, it is important to establish that pre-service teachers are not likely to use ICT simply because it is easy to use while it will not benefit them in their future job.

Closely related to the above findings was the positive relationship between job relevance and perceive usefulness. Consistent with the literature (Acarli & Saglam, 2015; Venkatesh & Davis, 2000), this study revealed that the pre-service teachers found the computer technology use to be relevant to their future job ($\beta = .114$, $P < .027$). This implies that since the pre-service teachers' perceived the use of computers as relevance to their future job they would be inclined to accept it and use it in their future classrooms to enhance teaching and learning. The last but not the least noteworthy finding was that, contrary to a local study by Zuberviel (2012) in Ghana which found that school leadership was not supportive of teachers' ICT integration in schools, this study found that leadership support had a positive influence on the pre-service teachers' perceived ease of use ($\beta =132$, $P< .005$). This finding warrants further investigation.

LIMITATIONS

Several limitations identified which themselves provided grounds for research opportunities for future investigation. First, the generalisability of the results due to the relatively small sample size of respondents from only two Colleges of Education out of 38 in the country. As the population of this study was limited to students from only two colleges, a large-scale survey encompassing all the 38 colleges in the country should be conducted to confirm the findings to a more general population. Additionally, it is recommended to employ mixed-method design with a larger sample, for future research to give more insights and better understandings on pre-service teachers' attitude towards ICT for instructional purpose. Lastly, further studies should be conducted to consider other equally important exogenous constructs such as self-efficacy, pedagogical beliefs and others which could account for these prospective teachers' attitude towards technology.

CONCLUSIONS

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Despite the discrepancy between the respondents perception of ease of use and usefulness of ICT, all in all, the study found that perceived ease of use and perceived usefulness were the main antecedents of the pre-service teachers' attitudes towards ICT which, in turn, predict their intentions to use the technology in their future classrooms. These two endogenous variables (PU and PEU) were also positively and significantly influenced by the two exogenous variables namely leadership support and job relevance. Given that job relevance has positive influence on perceived usefulness, organizing relevant ICT training programmes by the pre-service teacher education institutions to enhance the pre-service teachers' skills to use ICT with ease and knowing the benefits of using ICT in their profession could help develop positive attitudes, hence their intention to adopt technology for pedagogical purpose in their future classrooms.

Similarly, leadership in pre-service teacher education in Ghana should clearly communicate the importance of ICT integration in all subject areas and demonstrates it through visible modelling expectations. No matter how much training the pre-service teachers receive to prepare them for ICT adoption they will not successfully use the technology without the support of the leadership. As posited by Hooper and Potter (2000) setting a good personal example by the leadership by teaching with the technology in their respective subject areas will empower the pre-service teachers to develop positive attitude towards the technology for pedagogical purpose. Additionally, the pre-service teachers should be provided with effective supportive structures that will provide them with

successful experiences in ICT. This will help them to form positive attitudes towards the technology which will in turn enhance their intention to use the technology over time. For example, as it was practiced in Australia (EkinSmyth, 1998), introduction of a laptop scheme for the pre-service teachers will be a welcome development as they can learn the ICT skills on their own, and from colleagues whom they are comfortable with, when and where it will suit them.

More importantly, given that, it is difficult to support an innovation about which one has a little knowledge, it is of vital importance that the leadership in the Colleges receive appropriate training in ICT in order to increase their own knowledge to effectively inspire their staff as well as the students to adopt the technology (Flanagan & Jacobson, 2003).

The study has a number of implications for practice: First, this study, with its focus on pre-service teacher education in Ghana, a non-Western cultural educational environment, has introduced a fresh perspective to the literature on ICT adoption in pre-service teacher education in developing world context. Thus, this study has added to the existing empirical knowledge of the Technology Acceptance Model across cultures. Additionally, extending the original TAM by incorporating exogenous variables such as job relevance and leadership support, the study provided a new theoretical model, considered to be relevant to positively influence pre-service teachers' attitude towards ICT adoption process in Ghanaian pre-service teacher education context. Given that pre-service teachers' in the Colleges of Education would be acting as change agents for integrating ICT in the Ghanaian schools, knowing and understanding factors influencing these prospective teachers' attitudes towards ICT usage, would enable policy makers and curriculum designers better design teaching curriculum which can help enhance the use of ICT in teaching and learning among pre-service teachers and in-service teachers in future.

In conclusion, it is worthy to recognise that, in every ICT implementation in education process, the involvement of teachers and for that matter pre-service teachers has a critical role (Hernández-Ramos et al., 2014), therefore, school leaders, teachers and most importantly, pre-service teachers should be groomed to appreciate the contemporary surge in ICT usage and applications and appropriately groomed to harness the power of ICT for the better and positive advancement of education in Ghana rather than put impediment through their attitudinal deficiencies (MOEG, 2015).

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APPENDIX

Demographic Information

Please tick (√) the appropriate box

Gender: Male [ ] Female [ ]

Age Category: 18 & under [ ] 19-24 [ ] 25-30 [ ] 31-35 [ ] 36 & above

VARIABLES	QUESTIONS	ITEMS	SOURCE
Job Relevance	Using computers is important for my profession I consider ICT to be needed by my job Using computers serves the purpose of my profession	JR1 JR2 JR3	Acarli et, al, (2015 :712) Venkatesh & Davis, 2000
Leadership Support (LS)	I am supported and encouraged by my college principal to use ICT in my teaching always. My principal provides useful training for using ICT for teaching within my institution.	LS1 LS2	Hayes & Harriman, (2001:5)
Perceived Usefulness (PU)	Using computers will improve my work Using computer will improve my effectiveness Using computers will improve my productivity. I find computers a useful tool for my work	PU1 PU2 PU3 PU4	Luan & Teo (2009:265)
Perceived Ease of Use (PEU)	I find it easy to use ICT to do all that I want to do, with respect to teaching and learning. It is easy for me to become skilful at using ICT for teaching. Using ICT for teaching requires a lot of mental effort. Overall I find ICT easy to use in my teaching	PEU 1 PEU 2 PEU 3 PEU 4	Luan & Teo (2009:265)
Attitude Towards Use (ATU	Computers makes work more interesting I like using computers I look forward to those aspects of my job that require me to use computers Working with computers is fun	ATU1 ATU2 ATU3 ATU4	Luan &Teo (2009:265)