Preliminary Findings in the Development of a Theoretical Framework for Investigating ICT Integration in Teacher Education

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ABSTRACT

The following report is the result of a preliminary investigation in the development of a theoretical framework for investigating ICT integration, particularly in TESL (Teaching of English as a Second Language) teacher training. The study is primarily an empirical effort to develop a theoretical framework for investigating ICT integration in TESL teacher training. In identifying the predictive variables for the framework, the researchers conducted an intensive review of the literature which included a review of various models used in studies on ICT integration. The contributing variables identified in the present study were age, gender, experience, ICT proficiency, attitude, access to ICT infrastructure, support services, and exposure to ICT professional development programmes. In developing the framework, the study sought to determine the extent to which the observed variability in ICT integration could be predicted by these factors. The sample comprised 266 respondents working at the faculty or English Language Unit in various teacher training institutions across the country. The study predominantly employed quantitative methods of data collection. Interview data was used to corroborate information derived from the survey data.

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INTRODUCTION

The use of ICT, both as a teaching tool and a course by itself has been a practice in Malaysian Teacher Training Institutions for many years now. The use of ICT in these institutions is inevitable as many primary and secondary schools have begun using ICT in their teaching and learning. However, studies conducted within the country over the past ten years have consistently highlighted the lack of ICT integration among school teachers and faculty members in teacher training institutions despite large amount of funding provided by the government. According to Norhashim, Mazenah and Rose (1996), the use of resources such as ICT in the classroom has begun to have a populist effect in the Malaysian classrooms. Nevertheless, ICT integration has yet to reach desired levels (Teo, 2008) and therefore barriers to effective integration need to be identified and removed. The present study was initiated with the intention of developing a theoretical framework for investigating ICT integration among TESL teacher trainers. The composite model would consist of variables drawn from the existing literature on ICT integration. This paper discusses the development and testing of these key concepts. Concepts that are found to have a significant effect on ICT integration would conceptualise in developing a theoretical framework for investigating ICT integration among ESL (English as a Second Language) instructors in Malaysian teacher education programmes. It is hoped that the theoretical model would be instrumental in identifying the factors that promote or impede ICT integration within the context of the study.

ACCEPTING CHANGE

The management of information in an institution of higher education is of crucial importance. Teacher training institutions which run a multitude of in-service and pre-service programmes have to deal with the management of a monumental amount of information. These include student data, course outlines, teaching material and assessment scores. The advancement and incorporation of ICT in these institutions may help to make the task manageable. However as Petrides, Khanuja-Dhall and Reguerin (2000, p. 118) point out, the use of technology to manage information in institutions of higher education may only be "deceivingly easier." In reality, it is a difficult task as the shift in utilising technology does not have as much to do

with the actual use of the technology as it does with the shift in the norms and behaviours of the various components that make up the institution (Petrides et al., 2000). Davenport (1997) asserts that this change to a large extent is affected by the information culture practised by the institution. This would determine how and to what extent information is valued, shared and capitalized by the various mechanisms within the institution.

In a case narrative which discusses the implementation of information distribution systems in Midwestern University (MU), Petrides et al. (2000) assert the importance of the perpetuation of a culture which places importance on the sharing of information. They postulate that change which is perpetuated through the implementation of any technology based systems would be affected by a "complex interrelation of technology, people and information-related change" (Petrides et al., 2000, p. 124). In the case of MU, despite the initial money allocated, the system could not be implemented fully as the final roll out far exceeded the allocation. The increasing cost failed to get further approval for the project from the university authorities. Hence, the cost of implementation and continued maintenance with the employment of skilled staff to keep the system in working condition is a perennial problem with technology based information sharing systems.

Another problem which hampered the project as highlighted by Petrides et al. (2000) was subculture conflict. The project itself was mooted by junior faculty members who were well versed with technology. This was not well received by senior faculty members although they agreed that technology would be an advantage to the faculty. As the project was further implemented there was less of what was to be expected in terms of behavioural change and patterns of work. Senior faculty members preferred the old filing method whereas some junior faculty members withheld data. The junior faculty members who strived to keep the system working were neither rewarded nor recognised for their effort. In analysing this situation, Petrides et al. (2000) quote Morgan who notes:

> *When a high status group interacts with a low status group, or when groups with very different occupational attitudes are placed in a relation of dependence, organizations can become plagued by a kind of subculture conflict (Morgan, 1986, cited in Petrides et al., 2000, p. 137)*

In conclusion of the MU case study, institutions have to consider the local work culture and attitude prior to the implementation of any technology initiative, the management of information or the retraining of faculty members to use new implements:

> *As higher education institutions strive to improve access to information and integrate new technologies, it is clear that the information environment (including the people and their behaviours) is a critical deciding factor while striving for and designing new information management processes for decision-making. (Petrides et al., 2000 p. 126)*

Hence, despite monetary allocation, it is quite clear from the points raised by Petrides et al. (2000) that the people who make up the system are as important as the system itself. The success of innovation diffusion depends on the people who work with the innovation.

Recent developments in ICT innovation require teachers to equip themselves with ICT knowledge and ICT literacy. This encompasses word processing, electronic presentation skills, accessing the internet, handling electronic media, using server technology as well as sourcing for open educational resources. However, at the teacher training level, it has been noted that many teacher trainees find it hard to cope with ICT skills and therefore standards are still low (Teo, 2008). As potential teachers, it is important that teacher trainees learn to integrate ICT with pedagogical practice. Despite the increased availability of ICT implements and support services relatively few in-service teachers are prepared to integrate ICT in their teaching (Sang, Valke, Braak & Tondeur, 2009). Multimedia has the capability to enhance teaching and learning but the mere addition of technology would not render a lesson effective. In this respect, lecturers have the responsibility of modelling effective ICT integrated lessons for their students.

MODELS OF ICT INTEGRATION

ICT integration begins with the adoption and diffusion of an innovation. Integration is deemed as an innovation because it involves the adoption of new instructional technology that replaces old technology in the classroom.

The literature holds several different models that explain ICT adoption, diffusion and integration. These models also provide a framework to analyse the factors that affect the adoption and integration of ICT as an educational innovation. In this paper, the researchers discuss several theories which help to explain the variables that need to be considered in developing a framework for assessing faculty ICT integration in teacher education programmes. Though the theories highlighted here may not be exhaustive, they are instrumental in addressing some of the basic issues related to ICT integration in a teacher education programme.

The Concerns Based Adoption Model (Hall & Hord, 1987), also known as CBAM is acknowledged as one of "the most robust and empirically grounded theoretical model" for the study of educational innovations (Anderson, 1997 p. 331). It consists of a framework which supports the fact that learning results in change and supporting people experiencing change is important in enforcing what is learnt. CBAM examines change in three distinct ways, i.e. stages of concern, levels of use and innovation components (Horsley & Loucks-Horsley, 1998). The stages of concern help to explain how people feel when engaging in something new and their concerns in engaging the innovation. Table 1 provides an outline of the eight different levels of use of an innovation: non-use, orientation, preparation, mechanical use, routine, refinement, integration, and renewal (Hall & Hord, 1987).

Table 1: Levels of Use of an Innovation: Typical Behaviours (Hall & Hord, 1987)

Levels of Use	Behavioural Indicators of Level
VI. Renewal	The user is seeking more effective alternatives to the established use of the innovation.
V. Integration	The user is making deliberate efforts to coordinate with others in using the innovation.
IVB. Refinement	The user is making changes to increase outcomes.
IVA. Routine	The user is making few or no changes and has an established pattern of use.
III. Mechanical	The user is making changes to better organize use of the innovation.
II. Preparation	The user has definite plans to begin using the innovation.
0I. Orientation	The user is taking the initiative to learn more about the innovation.
0 . Non-Use	The user has no interest, is taking no action.

The concerns based adoption model would be affective in studies measuring innovation diffusion and how people feel about using the innovation. However, it would not be an effective framework for analysing factors that inhibit or enhance ICT integration. The levels of innovation which form the framework would be useful in investigating how people deal with an innovation but would not be effective in analysing the relationship between variables such as attitude, support services, ICT proficiency, content knowledge and pedagogic knowledge. Furthermore, these variables were established as important factors in ICT integration by studies done many years after the CBAM was introduced. Nevertheless, the model supports the fact that learning results in change and supporting people experiencing change is important. This factor lends support to the inclusion of variables such as support services and professional development to be examined in studies on ICT integration. Support services and professional development are management driven initiatives to support those who are interested in integrating ICT in their teaching.

In the 1980s and early 1990s, Apple Inc. provided some selected American schools with ICT resources, placing them directly in the classroom (Wilson, Dobrovolny, Batty & Ryder, 2000). This programme was known as the Apple Computer Classroom of Tomorrow (ACOT). Apple Computers conducted their own research on technology implementation in their project. This research yielded a five stage model of ICT implementation involving teachers and students acceptance of technology in the classroom (Dwyer, Ringstaff, & Sandholtz, 1991). The five stages as reported by Wilson, et al., (2000) are Entry phase, Adoption phase, Adaptation phase, Appropriation phase and Invention phase.

The ASCOT model documents and summarises the arduous journey of teachers through several stages of ICT adoption. These stages of adoption and the experience of these teachers lend credence and validity to the inclusion of several of the independent variables in the present study. For instance, the teachers in the programme had to struggle to find ways to integrate technology with their existing content knowledge and pedagogical skill. They also conducted activities which incorporated word processing and graphic programmes. This entailed an improvement in their ICT proficiency and ICT pedagogic content knowledge. However, their struggle would have been less burdensome if they had been provided with the appropriate

professional development programmes. In the final stage, attitude played an important role in the teachers' effective use of ICT. Finally, the ASCOT programme also established that student achievement increased with the integration of ICT in the classroom.

Studies on ICT integration have also advanced conceptual models of ICT integration. These models are instrumental in analysing the process of ICT adoption and integration. One such model is the Will, Skill, Tool model proposed by Knezek and Christensen (2000). The Will, Skill, Tool model postulates that classroom technology integration can be enhanced by positive increments on educators' will, skill and access to technology. This is subsequently expected to enhance student achievement. The model was postulated by Knezek and Christensen (2000) and used in a study undertaken to assess good teaching practices for technology integration. In assessing the efficacy of instructional design strategies based on the Will, Skill, Tool model, Knezek and Christensen (2000) utilised various sets of questionnaires and interviews in selected schools in the United States. This model highlights the importance of will, skill and tool technology in ICT integration. The factors identified by this model are not too far from the factors identified in Rogers' (2003) model.

Rogers (2003) proposes a conceptual model which outlines the innovation and adoption procedure within a specific context. According to this model, the process of implementing an innovation involves five stages (Berglund Center, 2008):

1. Knowledge - when a person or group begins to learn and know about a new innovation,

2. Persuasion – a person begins to form attitudes through interactions with others,

3. Decision - there is a drive to seek additional information and a decision is made,

4. Implementation - as regular use is attempted, more information is sought,

5. Confirmation - continuous use is justified or rejected based on the evidence of benefits or drawbacks.

Diffusion, according to Smith (2000) is the "process by which an innovation is adopted and gains acceptance by members of a certain community" (p.45). The process itself entails the collusion of several interacting factors. Rogers' (2003) definition of diffusion integrates four particular aspects: innovation, communication channels, time factor and a social system. Each aspect works in tandem, acting and reacting with the other three aspects. Therefore, no single element can be considered to work independently of the others. Any study on the diffusion of an innovation would involve an investigation of these major factors and a host of other interacting factors that could facilitate or impede the adoption of an innovation by members of a particular adopter group (Surry, 1997).

At the knowledge stage, an individual or organisation becomes aware of the existence of an innovation. At this early stage, the decision making unit is affected by demographic variables such as socioeconomic characteristics, personality and communication behaviour. In the next stage, the unit or organisation analyses or experiments with the innovation to ascertain its relative advantage, compatibility, complexity, trialability and observability (Rogers, 2003),

This is followed by the decision making stage, i.e. to adopt or reject the innovation. In the event that the organisation or individual decides to adopt the innovation, the next stage would be the implementation stage. Finally, at the confirmation stage, the individual seeks reinforcement of the innovation-decision already made or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation (Rogers, 2003).

The literature holds a large number of studies which used Rogers' diffusion theory to investigate ICT integration in an educational setting. Zayim, Yildirim and Saka (2006) used Rogers' diffusion theory to explore instructional technology usage pattern and the characteristics of faculty as well as factors that contribute to IT adoption.

Less (2003) carried out a research to classify faculty members in a North Carolina Community College System according to the five level classification system developed by Rogers (2003). Based on this system, faculty members could be placed on a continuum from "innovators"- those who adopted technology to "laggards"- those who resisted technology adoption. An important element to be noted in this study is after the classification, Less (2003) compared the faculty members on demographic variables such as age, gender, race/ethnicity, teaching experience and the level of highest education achieved. No differences were found in demographic data on race, gender and age when classified under Rogers' (2003) five categories of innovation adoption. However, there were differences regarding teaching experience and the highest education level achieved. In the second part of the study, faculty members were identified as users and non-users of technology in instruction. The study also sought to look for differences in demographic data between users and non-users. Less (2003) found no differences in demographic data between users and non-users. Those who adopted technology in instruction were found to utilize various techniques such as e-mail, website notice boards and management software for recordkeeping. Faculty members also reported that other faculty members and the president made an impact on them as change agents concerning technology adoption.

In another research, Sahin and Thompson (2006) conducted a study in an Anatolian University with an enrolment of 60,000 students. The respondents in this study were 157 full time faculty members in the college of education (COE) which included professors, associate professors, assistant professors and instructors. The response rate was 74.5%. The study employed Rogers' innovation diffusion theory as the framework to identify the respondents' position in relation to the innovation-decision process.

Sahin and Thompson (2006) used Rogers' innovation and adopter categories as the basis for constructing the instrument which was used to evaluate the respondents' status on the innovator category, specifically by assessing the respondents' ICT expertise and level of use in the instruction process. The survey instrument used in this study was a questionnaire which utilised a five point Likert scale. It consisted of sections which gathered data on respondent's instructional ICT use and expertise, access to ICT, barriers to ICT access, attitudes toward ICT use, and ICT support. It also had a

section to gather data on faculty characteristics or demographic data. Data analysis utilised correlation methods to identify the relationship between the level of ICT use for instructional purposes and other variables. The results of the study revealed that COE faculty members had high levels of ICT use for just three main tasks: internet, e-mail and word processing. The overall ICT use for instructional purposes was found to be very low. The open-ended response included in the survey indicated that respondents needed "support, training, knowledge about appropriate teaching pedagogies, improvement of school and classroom infrastructure, and time release from their teaching workload" (Sahin and Thompson, 2006, p.90). The study also revealed that the respondents' expertise in ICT use was limited to surfing the internet, e-mail applications and word processing. Overall, their expertise in ICT use in more specialized applications was very low. In terms of ICT access, the respondents' indicated that there was adequate access in their work areas and homes but such infrastructure was lacking in the classrooms where they taught. As for the question on barriers to ICT access, the respondents mentioned the lack of support for instructional use, lack of instructional software and the lack of technical support as major factors.

Rogers'(2003) theory is an important consideration in developing the theoretical framework posited in the present paper. The relevance of demographic factors, attitude, knowledge and context of usage in the adoption and diffusion of an innovation such as ICT integration in teaching has been established and well documented by the various studies which used this model. Hence, it lends credibility to the inclusion of these factors as variables in the development of the theoretical framework for this paper.

VARIABLES THAT AFFECT ICT INTEGRATION

The discussion thus far has highlighted several frameworks that need to be considered in studying ICT integration. The following discussion focuses on studies and views of researchers and ICT practitioners on the various variables that need to be considered in studying factors that encourage or hamper ICT integration in education.

Ertmer (1999) for example, categorizes these variables as internal and external barriers that hamper ICT integration. He classifies access

to technologies, training and local support as external barriers and key obstacles in ICT integration. When these barriers are present in an institution, integration is almost impossible. Ertmer (1999) explains further that even if these barriers were to be resolved, "teachers do not automatically use technology to achieve advocated meaningful outcomes" (p.51). Under these circumstances, the second internal barrier needs to be considered. This barrier addresses teacher's philosophy about teaching and learning. It involves their beliefs, self-efficacy and attitudes. These factors are often subtle and deep rooted. These factors and their effect on ICT integration and use have often been studied as individual variables but research evidence on the combined effect of these variables, i.e. teacher beliefs, teacher attitude and teacher self-efficacy on ICT integration and use is lacking (Sang, Valcke, Braak, & Tondeur, 2009).

Sang et al. (2009) sought to study the combined effect of teacher beliefs, teacher self-efficacy and attitude and gender on prospective ICT integration in teaching. The focus of the study was to explain the effect of the complex interplay between these variables on ICT integration in the class. The respondents in this study were 727 student teachers in four teacher education universities, majoring in primary education. An interesting factor about this study was the predominance of female students in the student teacher population. 93.5% of the respondents in this study were female students. According to the study, 81.1% of the overall population of student teachers in China are female; hence, the need to study the effect of gender on ICT integration. This situation is not too far from the Malaysian situation where there is a predominance of female students in teacher education programmes. Data on the variables were collected using a survey incorporating five different scales - constructivist teaching beliefs, teacher self-efficacy, ICT self-efficacy, ICT attitude and prospective ICT use. Data analysis was conducted using a bivariate correlation analysis procedure. The study revealed a strong positive relationship between the independent variables (constructivist teaching beliefs, teacher self-efficacy, ICT self-efficacy, ICT attitude) and the dependent variable (prospective ICT use). However, the path model analysis used in the study revealed that gender had only an indirect effect on ICT use.

Baylor and Ritchie (2002) sought to investigate the factors that facilitated teacher skill, teacher morale and perceived student learning in

technology-using classrooms. The framework used in this survey identified a total of twelve variables: technology planning, leadership, professional development. teacher openness to change, teacher non-school ICT use, curriculum alignment, technology use, technology integration, teacher technology competency, impact on content acquisition, impact on higher order thinking skills and teacher morale. The respondents were from 94 classrooms across four different states in the United States. The methodology employed to gather data included survey questionnaires and interview.

At the heart of every ICT endeavour in an educational setting is the integration of ICT with teaching and learning. The provision of ICT equipment and the training of teachers alone does not guarantee that integration would take place. Overall, there are simply too many factors to be considered that could impact on ICT integration. However, beyond the classroom teenagers are actively engaged in communication and entertainment using various ICT platforms. Each day, more than 100,000 videos are uploaded on You Tube and 80% of these two minute clips are produced by teenage authors working outside the classroom (ISTE, 2008). Yet within the classroom, the use of ICT is not as prolific or productive. A key factor in the classroom uptake of ICT is the integration of participatory technologies with content and pedagogy (ISTE, 2008). The participating technologies in the form of hardware, software and internet are myriad and they change rapidly. Therefore, engaging ICT for educational purposes is not a simple task. Koehler and Mishra (2009) state that, "If educators are to repurpose tools and integrate them into their teaching, they require a specific kind of knowledge that we call technological pedagogical and content knowledge (TPACK)" (p.15). The TPACK framework advanced by Koehler and Mishra (2009) is a way of thinking about how technology can be integrated into teaching. At the core of the framework is integration which is viewed as an intersection between Pedagogical Knowledge, Content Knowledge and Technological Knowledge.

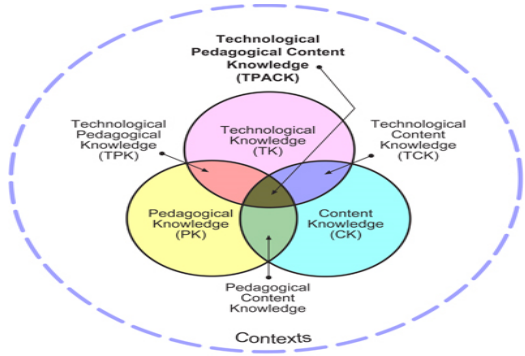

Figure 1: The TPACK Framework (Source: Koehler and Mishra, 2009)

Pedagogical knowledge (PK) is understood as a broad spectrum of knowledge and skills related to teaching. It includes knowledge of general teaching methods such as discovery learning, collaborative learning and problem-based learning. In the context of teaching and learning English, it would also contain knowledge of issues related to language acquisition, cognitive development, classroom management skills, student motivation and other pedagogical factors related to language learning and teaching.

Content knowledge (CK) is defined as a more specific knowledge related to the facts, concepts and skills that exist in the teaching of a particular subject matter such as English language proficiency or the training of English language teachers. Content knowledge is independent of pedagogical knowledge. Knowledge of pedagogy does not engender knowledge of content. For instance, a person who speaks English well would not necessarily be able to teach the language well. Teaching the language would involve knowledge of conceptualizing the pedagogy and content through various methods, approaches and techniques. Within the TPACK framework, this distinct knowledge adds another dimension known as the Pedagogical Content Knowledge.

Technological knowledge (TK) refers to the knowledge involved in the usage of technological implements. Technology is defined as everyday classroom technology such as chalks and blackboard and advanced technology such as the use of ICT tools. Knowledge of ICT tools could

also be viewed from different levels. At the basic level, it would involve knowledge of different file formats and basic usage of MS Office software such as MS Word. At an advanced level, it might include knowledge of particular software programs or knowledge of creating new software and applications. Within the TPACK framework, TK forms intersections with CK and PK, forming Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK) (Schmidt, Baran, Thompson, Mishra, Koehler & Shin, 2009). Figure 1 illustrates the complexity of knowledge forms produced within the framework.

Integration as posited by this framework seems to form only a small part between the overall intersections of different inherent knowledge forms. Trautmann and MaKinster (2008) in an apparent allusion to this complex interplay of knowledge forms state that "the size of this overlap [the centre of the TPACK diagram] indicates the extent to which a teacher has developed an integrated understanding of the complex relationships between subject matter understanding, pedagogical goals, and available technologies" (p. 92). What this means is that, as the level of integration grows, the circles grow closer until they merge into a single circle. At this ideal stage of integration, the various knowledge forms are integrated into one seamless entity. At this level of integration, it would be quite impossible to take the components apart or even to measure the quantum of the integrated components. Of the three core components in the framework, technology could be distinguished easily and the level of knowledge could be measured and quantified in a study. However, the level and type of content knowledge and pedagogical knowledge would be difficult to identify and measure. Furthermore, there is the question of whether it is necessary or even feasible to measure the content knowledge and the pedagogical knowledge of a lecturer or teacher who has the relevant paper qualifications and years of teaching experience. If the context of the study is an educational setting, it would suffice to take into account demographic factors such as academic or professional qualifications and experience in the relevant domain as measures of inherent content and pedagogical knowledge.

ICT INTEGRATION AND PEDAGOGICAL KNOWLEDGE

The relevance of ICT in teacher education as it is in any other form of education needs to be identified within the paradigm of educational philosophies. There are various philosophies which are relevant in the discussion of the role of instructional technology. The development of cognitive theories of learning and its applications for instance had led to new dimensions of expansion in instructional technology.

The incorporation of ICT in instructional technology provides novel and creative avenues for the realization of these cognitive concepts in the classroom. Piaget (1952) a reverential proponent of cognitivism, through his experiments and philosophical treaties made a case for experiential learning which in simple terms is defined as learning by doing. This theory also makes a strong case for ICT in teaching and learning as ICT in the classroom afford the possibilities for providing a hands-on experience for the learner. For instance, training learners to do a task the same way to enable consistency. Logging onto and off of a workplace computer is the same for all employees; it may be important do an exact routine to avoid problems.

STAFF PROFESSIONAL DEVELOPMENT

Integrating ICT with the needs of the curriculum seems to be a daunting task in comparison to integrating other instructional tools such as chalkboards, overhead projectors, paints and crayons. These are simple tools and as such, students and teachers have little problem in using them (Picciano & Seaman, 2010). ICT equipment, on the other hand is far more complex and it takes time and commitment to master the various educational applications. Hence, integrating these applications into the curriculum begins with ensuring that instructors have a basic working knowledge of the equipment and its pedagogic applications. Instructors would feel comfortable using ICT once they have developed a repertoire of instructional applications. Therefore, staff professional development is integral to ICT curriculum integration (Yates, 2007).

Faculty in Teacher Training Institutions in Malaysia are usually senior members who have served the profession for many years. Most of them are

also former school teachers who received their teacher training in an era when ICT was not used widely in teaching. Hence, whatever ICT knowledge that they have may have been gained through these professional development courses. The number of hours and the quality of these courses attended would certainly have an impact upon the faculty's use of ICT (Mehlinger & Powers, 2002). Professional development, faculty attitude towards ICT and faculty ICT proficiency are important dimensions in preparing the faculty to integrate ICT in their classrooms as pointed out by the Australian Council for Computers in Education (2003):

Political structures that say that investment in technology-supported classrooms in isolation will alter learning are misguided. Improved learning is a product of teachers using valid and appropriate strategies that are formed by an understanding of the available educational resources including technology. Teachers cannot do this from a technology-bereft position and without professional development to help them build a learning technology process. (p. 7)

Hence, lecturers cannot be expected to integrate technology in their teaching if they themselves are "technology-bereft". Professional development programmes are instrumental in helping the lecturers increase their ICT knowledge and subsequent integration of the knowledge in their classrooms (Mouza, 2006).

Shofield (1995) notes that the potential of instructional technology is never fully realized because often teachers are not aware of the best methods to integrate technology in the classroom. The provision of hardware alone is not enough if teachers are not skilled in using them in instruction as pointed out by the previous Malaysian Minister of Education, "There is no point in having computers and smart schools if teachers are not of the right calibre." (Hishamudin, 2005,p. 3). This brusque reminder is a wake-up call for all members of the education fraternity. Raising teachers and instructors alike to the "right calibre" entails providing them with the opportunities for quality professional development. The main objective of professional development is to help teachers improve in their professional knowledge and lesson designs to the effect that there is improvement in student achievement (Mouza, 2006).

Professional development is vital in helping teachers to "consider changes in ideas and beliefs as well as changes in knowledge and practice" (Mouza, 2006 p. 406) without which the provision of technology would be an exercise in futility. In the United States for example, Georgia and Florida are recorded to have the highest student to computer ratio (Jerald & Orlofsky, 1999). Georgia was recorded to have a student to computer ratio of 13:1. This rate is higher than the national average in the U.S. (Jerald & Orlofsky, 1999). High access rates and availability of computers in schools have placed both states as top ranking in technology infusion. However, despite the availability, effective integration in teaching and learning remained a setback.

In a survey report done by the U.S. Department of Education, it was found that only 20% of teachers felt confident to use technology in instruction. Adapting the mode of instruction in the classroom to include technology calls for improvement in the technology skills of teachers. The same report also noted that 78% of teachers attended professional development courses (Penrod & Harbor, 2000). The poor correlation between professional development and actual technology integration in instruction could be a result of the lack of a support structure and leadership by example in the school (Penrod & Harbor, 2000). Lack of effective professional development for teachers to incorporate technology in instruction was a key factor identified in the report Getting American's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge (Office of Technology Assessment, [OTA], 1996).The OTA (1995) report further stated that school districts spent less than 15% of the budget provided for technology on the professional development of teachers.

Willis and Mehlinger (1996) also note that pre-service teacher education programs were lacking in input on instructional technology. Hence, the lack of or outdated pre-service and in-service teacher education programs have become a stumbling block in preparing teachers to incorporate ICT in the process of teaching and learning. Pre-service teacher education programs are described by Kook (1997) as "the crucial issue to be addressed" (p.58). He speculates that the teacher of the future would have to depend on ICT for both personal productivity and for instructional activities. This has already become a reality in most educational institutions. Kook (1997) lists thirty-three important ICT skills for teachers, ranging from navigating the

Windows desktop environment, to using IRC chat, to installing software. He suggests that these skills should be part of the required components in teacher education programs. He also postulates that in the next century, "teacher education will be forced to accommodate a considerable amount of transformation to allow teachers to function effectively in the Information Age" (p.59).

ICT SUPPORT SERVICES AND ACCESS

ICT support services are an integral part of ICT integration (Tondeur, Valcke & Braak, 2008). The researchers' contention is that ICT support could enhance or impede the integration of ICT. Hence, it is important to ascertain the significance of support services for ICT integration. Support services can be defined as technical services provided as a form of assistance to members of the faculty in running the various ICT equipment in the teaching environment. It includes technical services rendered in the event of a breakdown or in helping to connect or set up peripheral devices. In other cases, lecturers may also need support services or technical assistance in handling certain software (Pelgrum, 2001). Access, on the other hand refers to lecturers' access to ICT equipment such as computers, display systems, audio systems, hand held devices and other digital equipment. It should be noted here that the provision of such equipment to an institution such as teacher training institutions does not automatically account for lecturers' access to the equipment. They may yet face barriers in their access (BECTA, 2004). Tondeur, Valcke & Braak (2008) state that it is important to consider the "proper amount and right type of technology available on the sites where teachers and students can use them (p.497)". Tondeur, Valcke & Braak (2008) also make a distinction between the availability of computers in general and the availability of computers in the physical setting of the classroom. Their contention is that ICT has a higher impact on learning when it is placed and accessed in the classroom during lessons rather than in a computer lab. Support service is also required for regular maintenance and upkeep of computers and other electronic devices to ensure the smooth running of the equipment when required during teaching. Lecturers or faculty who are already proficient users may be able to do without certain technical assistance but those who are less proficient would certainly value the services of these technicians.

In centrally run systems that are password protected, even those who are proficient with the use of ICT would require technical assistance in accessing files, folders and programmes. Lewis (2003) states that technical assistance is a vital factor in helping teachers to overcome the barriers that they face in ICT integration. Sicilia (2005) in her study also identifies technical problems as a major impediment in ICT integration. Faced with old or malfunctioning computers, faulty internet connections and printers that won't work and no one to render assistance can prove disastrous to ICT mitigation efforts in educational institutions. Sicilia (2005) concludes that technical barriers impede the smooth flow of classroom activities. Dakich (2009) concurs with Sicilia (2005) in suggesting that the lack of technical support hampers efforts in encouraging teachers to use ICT in their teaching. She also states that the lack of "in-time technical support" increases teacher's anxiety while reducing their "capacity to transform students learning with ICT" (p.445). Bingimlas (2009) reports that teachers have a strong believe in the effectiveness of ICT and therefore have strong desires to use ICT but their efforts are hampered by certain barriers. Among these barriers are the lack of confidence, competence and access. Bingimlas (2009) suggests that among other factors an effective support service would help teachers overcome these barriers.

Sicilia's (2005) study also highlights the importance of access to ICT resources. Teachers often have to book ICT resources which are shared and to wait in line to use these resources. The waiting time and unavailability of recources when they want to use it becomes a demotivating factor in ICT integration. According to BECTA (2004), the non-availability of ICT resources is not always due to the lack of hardware or software. It could also be due to factors such as poor organisation, administrative control over resources and lack of personal access for teachers. In teacher training institutions in Malaysia, most of the ICT resources are centred in computer laboratories. Access is granted based on bookings and availability of the laboratories. Likewise, other ICT resources are controlled and access is granted based on applications.

ICT INTEGRATION AND THE DEMOGRAPHIC FACTORS OF GENDER, AGE AND EXPERIENCE

Much of the literature on gender and ICT integration is based on an implied digital reticence among females and inequity of access (Gannon, 2008). Nevertheless, a review of the literature returned contradictory evidence on ICT integration by gender. Some studies indicate that males are more prone to technology adoption and integration whereas others indicate females as having a better disposition to adopt technology (Volman & Eck, 2001; Kabachi, Akbulut & Ozogul, 2009).

The literature also reveals studies which do not find a significant difference in ICT integration between male and female faculty members (Agbatogun, 2010; Mohd Izham, Norazah, Kamaruzaman, Rusnah & Yusma, 2010; Yates 2007). Liaw (2002) conducted a study on computer attitudes and web attitudes of doctoral students in a school of education. His findings indicated a significant difference between male students and female students in terms of their attitude towards computers and the internet.

Adams (2002) conducted a study on ICT integration and technology development programmes among faculty members. Adams (2002) reported that female respondents were more eager to attend technology development programmes and they were also more keen to integrate technology in teaching compared to male faculty members. Gender as a variable has the potential to influence ICT integration; therefore, gender is a variable that needs to be considered in the present framework. Gender could be a factor that influences English language lecturers' level of ICT integration.

Teachers' age and experience are bound to have an effect on the level of ICT integration. Younger teachers may be confident in using ICT due to their social exposure to ICT while older teachers' confidence could be due to their knowledge of ICT that they have garnered over the years attending professional development activities (McRae, Ainsworth, Groves, Rowland & Zbar 2001). An older study done by Oscarson (1976) revealed that faculty members who have been in the position for a longer time seem to be less prone to use technology compared to faculty members who have been in the position for a shorter period of time.

The National Centre for Education Statistics (2009) also reported similar findings whereby faculty members with less than nine years of teaching experience were more prone to integrate ICT in their teaching. Another study where experience is a variable was conducted by Adams (2002). Adams' (2002) respondents were 589 faculty members in a metropolitan teaching institution. His study revealed that faculty members with less than ten years of teaching experience were more likely to integrate computers and the internet in their teaching. The study also revealed female members with fewer years of teaching experience as the most active integrators of technology compared to their older male colleagues' who were the least prone to adopt technology. Venkatesh, Morris, Davis and Davis (2003) also reported similar findings in their survey of ICT integration among faculty members. They found older users lagging behind their younger counterparts in technology uptake. They also found younger users placing more importance on the extrinsic rewards of technology uptake compared to older members of the faculty. Contrary to these findings, Kennedy et al. (2008) and Teo (2008) stated that they did not find any significant relationships between technology and age. Kennedy et al. (2008) postulated that the divide between older and younger technology users was small and negligible. These inconsistencies call for further studies in identifying the relationship between faculty ICT integration by age, gender and experience.

ATTITUDE TOWARDS ICT AND CHANGE

In any learning institution, the teacher or instructor is the most important asset. The successful implementation and diffusion of any teaching and learning innovation would vastly depend on the instructors' attitude, preparedness, skills, commitment, knowledge and support. ICT assisted teaching and learning involves the manipulation of an artificial intelligence in helping students to learn. In an ICT assisted learning environment, the ICT equipment can be manipulated to function as the facilitator, instructor and tutor which are all in fact the traditional role of the teacher and instructor. However, the success of these initiatives depends on proper planning and implementation. Another important factor in this equation is the attitude of the parties concerned. In teacher training institutions, these would comprise the lecturers, the IT department, the IT maintenance unit, and the various

heads of departments and finally, the higher administrative council. The positive attitude of the staff at various levels of the institution is an important variable in the ICT integration framework.

Attitude as a construct of psychology is often difficult to define within a research paradigm. According to Heneson, Morris and Fitz-Gibbon (1978), attitude is "…..a tool that serves the human need to see order and consistency in what people say, think and do, so that given certain behaviours, predictions can be made about future behaviours" (p.11). In this sense, attitude is an important predictor of an individual's academic achievement in a learning environment. In general, attitude can also be defined as a predisposition to act in a certain way towards achieving an objective or situation (Triandis, 1971).

In the teaching profession, the use of ICT in the classroom begins to a large extent with a change in the attitude of teachers towards the integration of ICT in the classroom. This may involve having to move out of their established comfort zones. In a study conducted by Snoeyink and Ertmer (2001), one teacher explained that it was important for her to feel comfortable with her teaching. Learning to integrate ICT in her teaching would mean moving out of that comfort zone which she felt she would not be able to do.

Taylor et al. (1997) postulate that attitude is a combination of three components. The first is the cognitive component which explains one's comprehension and beliefs of an issue or object. The second is the affective component that deals with one's thoughts and feelings and the third is the psychomotor component which defines one's reaction towards different situations. All the components can be placed on a positive or a negative scale. In integrating ICT in their teaching, instructors need a comprehensive understanding of what constitutes ICT. This would require an understanding of the various components that make up ICT in an instructional situation. They would, in other words, require a good understanding of content knowledge, pedagogical knowledge and technology proficiency. The psychomotor component would only come into play when comprehension and belief in ICT is accomplished.

Attitude can be the deciding factor in a faculty's acceptance and integration of ICT in their daily routines as well as incorporating it in their teaching. A positive attitude is a pertinent factor in spurring people to learn and educate themselves in using an element (Teo, 2008). In the initial stages when ICTs were introduced to schools, teachers were naturally apprehensive about incorporating it into the process of teaching and learning. This apprehensions is closely related to their feelings and thoughts about ICT stemming from their fear, confidence factors and perceived importance or the lack of it. In a study conducted in Singapore, Lim and Khine (2006) revealed that the use of ICT among teachers was still lacking. In this study, only 14% of the teachers surveyed used ICT at least thrice a week and 46% used it only once a week. Data analysis revealed a very low min average for attitude towards ICT. The seeds of this apprehension could be traced back to teacher training colleges. Lim and Khine (2006), for instance identified teacher trainees as lacking in the use and knowledge of ICT. This study also found that teacher trainees do not use ICT extensively in accessing educational materials on the net. The literature holds numerous other studies on the impact of attitude and adoption of ICT in instruction. These studies find attitude to be a predictive component in ICT integration. One such study was conducted by Albirini (2004). This study investigated the attitude of high school instructors teaching English as a Foreign Language (EFL) towards ICT. The study also investigated the respondents correlation between computer attitudes and five independent variables: ICT attributes, cultural perceptions, ICT competence, ICT access, and personal characteristics (including professional development). The study revealed that the respondent had a positive attitude towards ICT in instruction. The respondents' attitudes towards ICT was measured by predicting their ICT attributes, cultural perceptions and ICT competence. The findings of this study emphasised the significance of a positive attitude towards ICT in its diffusion and adoption in an educational setting. Sahin and Thompson (2006) in a study done in an education faculty of a Turkish university reported that attitude was significantly correlated with ICT applications for instructional use. Based on this findings, Sahin and Thompson (2006) postulated that the said faculty had a high probability chance of technology adoption. These studies help to place attitude as an important variable in investigating ICT integration in classroom teaching

THEORETICAL FRAMEWORK

The objective of the present paper is to develop a composite framework for the study of ICT integration among education faculty members engaged in teacher training and teacher education. A review of the literature has provided valuable insights on the various models and variables that have been used to study ICT integration. However, the literature has also indicated a "complexity of rationales and terminology that underwrite various initiatives; various dimensions and stages of integration; inherent methodological difficulties; obstacles to integration; and significant issues relating to teacher professional development and ICT competencies" (Jamieson-Proctor, Burnett, Finger & Watson, 2006, p. 511) to be considered. The present paper in reviewing the literature has also highlighted various frameworks that can be used to think about ICT integration. Baylor and Ritchie (2002) for instance highlight the importance of teacher skill and teacher morale in technology integration. Sang et al. (2009) seek to study the combined effect of teacher beliefs, teacher self-efficacy, attitude and gender on prospective ICT integration in teaching. Ertmer (1999), on the other hand categorizes internal and external barriers that hamper ICT integration. He classifies access to technologies, training and local support as external barriers and key obstacles in ICT integration. The Innovation Decision Process Model (Rogers, 2003) highlights several institutional factors such as the characteristics of the innovation, support services and professional development as factors that might affect the diffusion of ICT as an innovation. The Will, Skill, Tool model, posited by Knezek and Christensen (2000) advocates the importance of attitude, skills and the availability of tools. Finally, in a more recent development the TPACK framework (Figure 1) advances the importance of the interplay between various forms of inherent knowledge within the instructional context in producing technology integration.

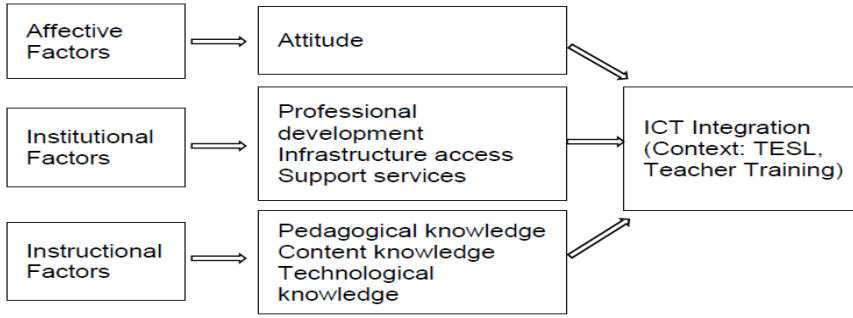

Figure 2: Theoretical Framework

Due to the complexity of factors that interplay in the discussions of ICT integration, no one single framework of variables can be sought to represent ICT integration. Therefore based on the literature, this paper has identified three important strands that can be synthesised from the various frameworks and models that have been discussed in this review. These strands represent the Affective Factors such as attitude, Institutional Factors such as professional development, infrastructure access and support services and lastly, Instructional Factors such as pedagogical knowledge, content knowledge and technological knowledge. These findings are not exhaustive as there may be many more factors that affect ICT integration. They serve as limitations within which the researchers sought to develop the framework. Collectively, these variables form the initial theoretical framework which conceptualises the composite nature of the intersecting variables that contribute towards ICT Integration in TESL teacher education (Figure 2).

RESEARCH METHOD

The population in this study constitutes of lecturers attached to the English Language Unit in Malaysian Teacher Training Institutions. They conduct both in-service and pre-service TESL Teacher Education programmes. The instruments selected to gather data would be administered to a sample of this population which consists of 266 respondents.

According to Gay and Airasian (2003), reliability is the degree to which an instrument is able to consistently measure a variable. The more reliable an instrument or a scale is, the more confidence the researcher

has that the obtained scores are essentially the same scores that would be obtained if the scale is administered to the same samples.

There are a number of different reliability coefficients. One of the most commonly used is Cronbach's Alpha, which is based on the average correlation of items within a test. This analysis determines how all items within the instrument measure the same construct. Reliability is expressed numerically as a coefficient that varies between .00 and 1.00. The closer the alpha is to 1.00, the greater the internal consistency of items in the instrument being assessed (George & Mallery, 2003). The reliability of the scales and questionnaires used in this study are shown in Table 2. This analysis was done using the statistical package for social sciences.

Table 2: Reliability of the Instruments

Instruments	Cronbach's Alpha
1. Survey of ICT Integration.	.85
3. Survey Of ICT Infrastructure Access And Support Services	.86
4. Survey Of Staff Professional Development	.85
5. Faculty Attitude Towards ICT	.96
6. Survey of Staff ICT Proficiency	.95

The Faculty Attitude Towards ICT Scale has the highest alpha coefficient, which was .96. This alpha value suggests a very high level of internal consistency. The alpha coefficients for the Survey of Staff ICT Proficiency, Survey Of Staff Professional Development, Survey Of ICT Infrastructure Access And Support Services and the Survey of ICT Integration fell between .85 and .95 range. Based on George & Mallery's (2003) statements on interpreting reliability statistics, these instruments have very good internal consistency.

Apart from the six surveys mentioned above, a Survey of Staff Demographics was used to collect information on demographic factors such as age, gender, level of education and teaching experience. This survey was developed by the researchers for the purpose of this study.

The survey of Faculty ICT Integration gathered data on the level of ICT integration in teaching by faculty members. The items in the survey were adapted from Davies (2009) and Sahin and Thompson (2006). The survey contained 13 structures which were tested on 50 items and scored on a five point Likert type scale. The following Table 4 shows the 13 structures used in the survey.

Table 3: ICT Integration Structures

No	Instructional Activity Using ICT	Item
	Word processing / call authoring software	1 - 9
	Text reconstruction software	10 - 12
	Reference tools: electronic dictionaries and encyclopaedias	13 - 16
	Audio/video files	17 - 19
	Learning Management System (LMS)	20 - 26
	Course Management System (CMS)	27 - 28
	Multimedia slides	29 - 31
	Wikis for teaching	32 - 33
	Blogs	34 - 35
	Social networking sites	36 - 37
	Email	38 - 39
	Mobile hand held devices	40 - 42
	Administration and management	43 - 50

The survey of ICT infrastructure Access and Support Services was developed by the researchers as a self-report instrument that gathered data on faculty members access to ICT equipment and technical maintenance service at their respective faculties. The scale consisted of 25 items. These items were drawn from a review of the literature on the factors that affect ICT integration (Mumtaz, 2000; Zayim, Yildirim & Saka, 2006; Pelgrum, 2001; Guha, 2000 & Granger, 2002). Based on literature review, the items in the survey were structured along the following nine categories (Table 4):

Table 4: Content Specification of ICT Infrastructure Access and Support Services Scale

	Category	Tool	Item
A	Standalone computers	computers in the classroom	1
		computers for staff	2
B	Computers for whole class access	computer lab/room	3
C		games software	4
		problem solving software	5
		tutorial software	6
		reference software	7
		multimedia-graphics software	8
		simulation software	9
D	Presentation tools	interactive whiteboard in the classroom	10
		LCD projectors in the classroom	11
		audio equipment for vcd/cd/dvd playback in the classroom	12
E	Management tools	central online student database/info systems	13
		online exam scoring systems/uploading marks	14
		institutional course management systems	15
F	Peripheral devices	hand held devices	16
		scanners	17
		digital cameras	18
		Printers	19
G	Internet	the internet in the classroom	20
		staff internet	21
		student internet-wifi	22
H	Database	online digital library/database	23
I	Maintenance and support services	Technical maintenance services	24
		Technology support services	25

The Survey of Staff Professional Development was developed by the researchers for the purpose of gathering data on the number of hours of ICT professional development courses attended by the respondents over the past four years. The respondents were provided with a list of courses and workshops relevant to their teaching. Respondents indicated the number of hours of courses they had attended for each category:

1. Course on MS Office (Word, PPoint, Excel, Publisher).

2. Courses on graphic manipulation - (Adobe).

3. Course on handling AV.

4. Statistics/Research (SPSS, NVIVO, AMOS).

5. Data storage/question bank.

6. Handling course management software.

7. Use of social networking, blogs, wikis, email in teaching English.

8. Web page construction (Wordpress, joomla, Dreamweaver).

9. Interactive teaching using web 2.0 application for teaching English.

10. ICT integration in teaching in general (no specific subject).

11. Theory of ICT integration in teaching a specific subject such as English, Science, Mathematics, etc.

12. Hands-on ICT integration in teaching a specific subject such as English, Science, Mathematics, etc. (includes the use of any software/hardware such MS office in teaching a particular subject).

13. Other general courses on ICT.

The survey of Faculty Attitude Towards ICT (FAIT) gathers information on faculty members attitude towards ICT. The items included in the survey were adapted from the Survey of Teachers' Attitudes Toward Computers which is a 99-199 item Likert/Semantic Differential instrument for measuring teachers' attitudes toward computers (Knezek & Rhonda, 2000). FAIT was constructed on a four factor structure consisting of Enthusiasm/Enjoyment (F1), Anxiety (F2), Avoidance (F3) and Productivity Improvement (F4). The survey contained 64 items scored on a five point Likert scale.

The Survey of Staff ICT Proficiency gathered data on faculty members level of ICT proficiency. The survey was developed as a self-assessment instrument which the respondents could use to assess their own proficiency. The items in the survey were adapted from the ICT for Language Teachers' Project (Davies, 2009) and the Technology Proficiency Self-Assessment Instrument (TPSA) developed by the Texas Centre for Educational Technology (TCET) (Ropp, 1999). The present survey had a nine factor structure containing 101 items and was scored on a four point Likert type scale. Table 5 provides an outline of the nine factors.

Table 5: Technology Proficiency Measurement Scale

	Measurement Scale	Item No.
1	Word processing	1 - 24
2	Browsing	25 - 45
3	Email software	46 - 59
4	Presentation software	60 - 70
5	Spread sheet	71 - 80
6	CD-ROM, DVD and CD-audio disc	81 - 88
7	Image capture & editing	89 - 92
8	Audio recording and editing software	93 - 96
9	Video recording and editing software	97 - 101

ANALYSIS OF STATISTICAL DATA

The following discussion provides statistical validation of the theoretical framework. This is deemed necessary as the theoretical framework is developed by the researchers and therefore, it requires proper validation and justification.

REGRESSION ANALYSIS

The findings of the stepwise regression analysis in Tables 6 and 7 show that the independent variables, faculty ICT proficiency, faculty ICT attitude, faculty ICT professional development and faculty ICT access are significant ($P < 0.01$) predictors that contribute (24.1 percent) towards faculty ICT integration.

Table 6 and Table 7 provide the results of a stepwise regression analysis. All six variables were factored step by step in the model. However, only faculty ICT proficiency, faculty attitude towards ICT, professional development and ICT access were found to be significant contributors towards the total variance in faculty ICT integration. R^2 provides the proportion of the variance in Faculty ICT Integration accounted for by the set of predictor variables entered in the modal. The Beta value in the table indicates the strength of each predictor variable in influencing the criterion variable.

The finding of the study indicate that there is a correlation of 0.252 (R Square) between the dependent variable (faculty ICT integration) and the select group of independent variables. The collective level of significant variance between the dependent variable and the independent variables in the regression model is valued (R^2) at 24.4 percent.

Table 6: Results of The Regression Analysis Predicting ICT Integration

Variable (X)	*B*	β	T	Sig.T	R^2	Contribution
Proficiency	0.188	0.215	3.831	0.000	0.098	9.8%
Attitude	0.190	0.173	3.017	0.000	0.068	6.8%
Prodev	0.199	0.274	4.811	0.000	0.042	4.2%
Access	0.578	0.241	4.291	0.000	0.036	3.6%
Constant	0.335		1.176	0.241		

Indicator :
- Proficiency = Faculty ICT Proficiency
- Attitude = Faculty ICT Atitude
- Prodev = Faculty ICT Professional Developmet
- Access = Faculty ICT Access

R Square	0.252
Adjusted R Square	0.0241
Std. Error	0.07777

Table 7: Analysis of Variance

Source	Sum of Squares	Df	Mean Square	F	Sig.F
Regression	19.723	5	3.945	18.073	0.000
Residual	51.755	260	0.204		
Total	71.479	265			

The result of the multiple regression analysis shown on Table 6 shows the status of the predictor variables that influence and contribute to ICT integration among the respondents.

The analysis shows that the most important predictor of ICT integration into teaching and learning is faculty ICT proficiency ($\beta = 0.215$, T = 3.831 and Sig.T = 0.00) with a contribution of 9.8 percent. This would mean that the addition of one unit of ICT proficiency could induce an increase of 0.215 unit of ICT integration among the respondents.

The second most important predictor with a contribution of 6.8 percent towards faculty ICT integration is faculty attitude towards ICT integration ($\beta = 0.173$, T = 3.017 and Sig.T = 0.00). This would mean that the addition of one unit of faculty ICT attitude would contribute an increase of 0.173 units of ICT integration among the respondents.

The third most important predictor is faculty ICT professional development which also contributes 4.2 percent of ICT integration in the model ($\beta = 0.274$, T = 4.811 and Sig.T = 0.00). This finding indicates that an addition of one unit of faculty ICT professional development could induce an increase of 0.274 units faculty ICT integration.

The last predictor in the model is faculty access to ICT which contributes 3.6 percent of ICT integration in the model ($\beta = 0.241$, T = 4.291 and Sig.T = 0.00). This finding indicates that an addition of one unit of faculty ICT access could contribute an increase of 0.241 units of faculty ICT integration.

CONCLUSION

The above discussion has provided an outline for the development of a theoretical model for analysing the inherent factors within the context of teacher training institutions. The researchers have discussed various frameworks and variables available in the literature on ICT integration. A review of this literature was instrumental in identifying the cogent variables used to study ICT integration. These variables were included in a theoretical framework and its effectiveness was tested using actual field data. Statistical procedures were used to ratify the effectiveness of the model. It is hoped that the model would be able to predict the factors that promote or hinder ICT integration within the stipulated context. The final regression model has identified faculty ICT integration, faculty attitude towards ICT, faculty ICT professional development and faculty access to ICT as significant contributors to ICT integration. As a consequence of these findings, the initial framework needed to be revised, rejecting ICT support services and demographic variables such as gender, age and experience. This would be useful for policy makers and administrators who need data on factors that hinder or promote ICT integration in their institutions. As a composite model, it would be able to provide information on multiple factors and the relationship between these factors.

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