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The role of technology within Higher Education: An examination of impact on student engagement

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Abstract

Educational institutions across the world are looking at measures to integrate technology into the curriculum by identifying its role in promoting Higher Education. While a great deal of literature has examined the impact and role of individual stakeholders with respect to technology implementation in Higher Education, there is limited evidence to support the need for a multi-stakeholder approach in order to understand the role of ICT technology in enhancing the student learning experience.

This dissertation focuses on identifying the role of technology within Higher Education by identifying the perspectives of various stakeholders. In this study questionnaires were presented to students while interviews were conducted with instructors in order to identify their opinion by adopting a web survey approach. From the study it is established that the student perception and teacher views on the role of technology (i.e. ICT) in Higher Education are important to identify benefits, challenges and barriers. Research results provide an important springboard for the development of ~~the~~ quality standards in the UK with respect to Higher Education.

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Chapter One: Introduction to the study

1.1. Introduction

The world has moved from the Stone Age to the space age through the improvement and achievements of science and technology. The basis of this change has been attributed to the advancement of education as it forms the guiding factor for growth of economies and is the panacea for global problems (Howell, et al., 2004). The advancement of education has been associated with the growth of innovative technologies which have helped create a global network crossing social and geographical limitations (Tripathi and Jeevan, 2010).

Information and communication technologies (ICT) have been described as a varied group of technical instruments and resources utilized to impart and to generate, distribute, accumulate and handle information (Bates, 2005). The utilisation of ICT in learning initially started in the 1980s, when efforts were under taken to entrench ICT in learning procedures, particularly in classrooms ((Kim and Bong 2006). During the initial stages of investigation in ICT in learning, the emphasis was mainly directed towards the ways in which computers could be successfully implemented into the classroom. Schools and universities utilized computers, which were believed to be computational tools, mostly to mechanize procedures that existed (Levin and Arefesh, 2002). . The considerable technological accomplishments during that period incorporated the launch of multimedia personal computers in schools and colleges, their link to the Internet, and the growth of certain functional instructive software(Marzano et al., 2001).

Educational institutions across the world are looking at measures to integrate technology into the curriculum by identifying its role in promoting higher education and examining the different determinants which impact the adoption of technology. This dissertation focuses on identifying the role of technology within higher education by identifying the perspectives of various stakeholders.

1.2. Study rationale

Technology is viewed as a tool which is modern and appropriate for the present generation of students, and which promotes student access to communicative and dynamic teaching resources (Chai et al., 2010). By examining the interaction of different stakeholders in ICT, the role of ICT in enhancing student language skills, and its ability to collaborate and show complete commitment with the curricular content is identified. Therefore it is established that time and place are not of paramount importance in an educational process which involves ICT, as it permits "anytime, anyplace" education, which could be tailored and personalized to the individual student's requirements and capabilities (Hammond et al., 2011).

Acknowledging the possible advantages of ICT in the area of teaching and learning, several individuals (such as Teo, 2009 and Chen 2010,) have recommended constructivist reforms that question conventional methods of education, and which sponsor "the effectual and inventive utilisation of ICT in teaching and learning" by teachers (Chen, 2010, p. 32). In this latest concept of meaningful learning (Donnelly, et al., 2011), knowledge is collaboratively promoted by the teachers and the students (Chai et al.,2010).

Within this background it is important that research be conducted in a manner which identifies the role of technology within the realms of higher education. This type of research will help identify the role of technology in enabling instructorsarriving at curriculum designs (and instructional designs) that impact student engagement, whilst identifying the barriers faced by the educational institutions in implementing these technologies in their classrooms. Hence, we need to develop research methods to solve teaching and learning problems, whilst at the same time being able to offer design principles for future progress.

1.3. Importance of study

There is a constant increase in the number of higher education programs. Many factors, such as international student mobility, cross-border universities, the free circulation of services in a globalising economy, and improved learning strategies in

higher education, higher education has gained a lot, not only in a national but also in an international dimension. In addition to this, issues such as accreditation and acceptance of diplomas are now among the more important agenda topics in terms of bilateral and multilateral relations (Roblyer and Knezek, 2003). However, it is a fact that there are some uncertainties in higher education with respect to the type of promoted technological tools.

This study will provide higher-education institutions and organisations with valuable information for the application, examination and maintenance of technology in their programs. This study is of direct importance for the managers and instructors working in higher education institutions as well as for their students. At the end of the study, the views of students attending higher education institutions in our country will be determined with respect to role of technology in enhancing learning. Research results will also provide an important opportunity for the development of the quality standards in the UK with respect to higher education.

1.4. Summary of the Problem

There are few studies specifically directed at the use of technology in adult higher education with a focus on growth of educational technology and degree of integration of this technology. This analysis will provide a model for describing the role of technology within higher learning, as well as offering a means for assessing emerging learning strategies and their suitability for adult higher education. The survey tools used to describe and evaluate the higher learning strategies specified in this investigation can later be applied to other forms of education (primary, secondary, vocational).

1.5. Aims and objectives of study

- To describe the current trends in the growth of technological applications in university level higher education in UK.
- To examine the role of technological applications in maintaining student engagement

- To investigate how technological applications can promote effective instructional design by educators in higher education and thereby impact student engagement
- To identify the barriers to implementation of technological innovations and investigate measures of overcoming these barriers by presenting recommendations of implementing technology in education

1.6. Organisation of thesis:

The outline of the dissertation is briefed in this section as follows:

Chapter One – Introduction – The background of the research study is evaluated in this chapter.

Chapter Two – Literature Review – In this chapter there is an in depth review of the most significant work that has been undertaken in this area.

Chapter Three – Research Methodology – In this chapter the focus is laid on the methodology adopted for approaching the research question.

Chapter Four – Results and discussion – In this section the data obtained is analysed on the basis of the facts.

Chapter Five – Conclusion – In this section concluding remarks are made with reference to the research question in hand.

Chapter Two: Review of Literature

2.1. Introduction:

Researchers in extant literature (Sang et al., 2010; Selwyn 2007; Turner 2012; Donnelly et al., 2011) identify the advantages of information and communications technologies (ICT) in education. From a teaching perspective, the utilisation of technology permits the competent formation and processing of lesson plans and experiments, and further permits tutors to effortlessly distribute and systematise resources with co-workers. From a learning perspective, technology can be identified as a multimodal methodology which is able to address the requirements of students, thereby augmenting student engagement (Sang et al., 2010).

This review of literature establishes the degree of integration of technology in education, the roles and capabilities of the educators (teachers/lecturers), the use of technology in promoting student engagement, and the barriers faced by the organisation to promote Technology Based Education (TBE). The following section examines the role of ICT integration in education.

2.2. The Role of ICT integration in education:

The role played by technology in enhancing the excellence of education and training is irrefutable. This potential has been examined and established in extant literature (Turney et al., 2009; Bates and Sangra 2011; Meyer 2010). Valdez (2004) finds that technology provides numerous chances to enhance education, and states that it has the potential to offer individuals information and educational resources, which was previously only feasible in reputed universities and not in high school education. Hew and Brush (2007) suggests that technology in learning might endorse novel educational surroundings wherein investigation and problem- solving augments student accomplishment. Hansen (2003) emphasizes the significance of technology in training and identifies it as a dominant means for assisting people to attain their individual and collective objectives.

The induction of ICT in learning, particularly higher education, is encouraged by certain internal and external determinants that impact higher education teaching methods (de Boer et al., 2007; Osika et al., 2009) and associated research procedures (de Boer et al., 2007). When internal determinants are considered they can be associated with varying factors, including the personal motivation of the tutor to improve their current measures of teaching (Finn and Ledbetter, 2012; Johnson et al., 2010), the promotion of varying strategies and undertaking by educational institutions (Fox, 1999; Selwyn 2007; Selwyn 2012), and the level of student engagement with technology(Means 2010; Tsai and Tsai, 2010). .

External determinants that impact the implementation of ICT in learning are extensive, and are mostly based on government directives and developmental policies (Ball, 2012), changes in the national demographic profile (Selwyn, 2010), the growth of the knowledge economy, and the globalisation of education (Turner 2012; de Boer et al., 2007). Other factors including technical advancement, the accessibility of digital media and digital equipment and applications and networks influence the use of ICT in higher education in conventional and unconventional surroundings need to be examined (Blurton, 1999; Beyth-Marom et al., 2003). More details into these measures do not directly answer the proposed research questions. Therefore, the focus of this study is to identify the impact of internal determinants on the use of informational technology in education by examining the student, teacher and organisational perspectives.

The utilisation of information technology is found to vary with the degree of usage by students and teachers (Hew and Cheung, 2010). Technology is used to assist in studying a unit of content, in lieu of a teacher, by way of exercises, training, lessons, replication, exhibition, and problem solving. It can further be utilised by students to help them to finish their assignments, for instance by making use of word processors, spread-sheets, databases, the internet, graphics programs, and other unique application software (Gunning, 2008; Bates and Sangra, 2010).

Teachers are found to make use of ICT resources such as electronic white boards that assist lectures and displays. ICT is also employed as a tool by teachers for organisational work including executive and institutional implements to formulate curriculum, lesson plans, assignment work and assessment, and to send notices to

students on-line (Hughes, 2012). A few innovative teachers become involved in trial ventures that promote the role of ICT in education. For instance, a study by Mecharacher et al., (2006) identified the role of technology in promoting innovation. In this study, teachers took up a digital video-editing assignment that targeted at studying "how creativeness can be incorporated in present arrangement and curriculum of preliminary teacher training" (Mecharacher et al., 2006, p. 51). The use of such methods promoted the teacher's education of technology and their understanding of the role of ICT in higher education. The following sections will examine in detail the importance of ICT from the perspective of different stakeholders including teachers, students and educational organisations as a whole.

2.3. Teachers and Technology

The literature review identifies a significant amount of literature that identifies determinants of teacher's 'pre-service or in-service' of the incorporation of technology in their classrooms (Sadaf et al., 2013; Lee and Jackson 2012). This section will examine the way tutors are currently utilizing technology, the features that encourage them to use it, and the prevalent difficulties that are present in the incorporation of educational information and communication technologies.

The literature shows that tutors utilise technology in one of two different established methods. In the first method, teachers have a tendency to utilise technology in a traditional manner wherein the technology device is used as a 'teaching machine'. In this method, technology is rarely utilised for the intention of teaching procedures, and these tutors regularly neglect to utilise technology in methods that encourage students' knowledge building (Chai and Lim ., 2011; Thieman, 2008). Technology is used only for the purposes of communication (Chai et al., 2010), reiteration of subject matter (Donnelly et al., 2011), and observation of student improvement (Mueller et al., 2008; Teo et al., 2011). In addition to this they maintain statistics, correspond with others, and carry out investigation on the Internet (Sutton, 2011).

The second and more recent method involves the use of technology by way of a constructivist approach. The constructivist outlook assists teachers in making use of ICT to extend classroom limitations, link-up learners to current affairs, and to help them to evolve as self-learners with the help of dynamic and cognitive education (Teo, 2009a, p. 7). For example in the case study approach of De Gennaro (2010),

when confronted with the latest constructivist teachers, trainees seemed to be perplexed and confused when it came to the identification of their latest responsibility as co-builders of knowledge, in addition to inaccessibility of the conventional transmission-oriented course structure. Despite being individuals who are proficient in modern technology, the teachers in De Gennaro's research were unable to move away from the conventional methods and fields in which they had been taught, and had difficulties in utilizing technology for student-oriented education. The following section examines the factors that have an impact on the use of technology by teachers for higher education.

2.3.1. Institutional support

The background of an educational institution can influence the way teachers opt to incorporate technology into their classrooms. This background comprises of both external (Chai & Lim, 2011) and environmental features which are exogenous and extrinsic to tutors (Chen, 2010; Lambert & Gong, 2010) and includes approach, backing, and the institutional cultures. To enable a framework to be of support to technology incorporation, International Society for Technology in Education (ISTE) acknowledges the necessity to be consistent and provide adequate capital to backup technology framework, workforce, digital resources, and teacher development (ISTE, 2009).

Being able to share computer facilities and collective resources, such as interactive white boards and video cameras, is further examined by numerous investigators (Starkey, 2010). The availability of technological backing is seen as a significant stipulation to assist teachers in utilizing technology (Teo et al., 2011; Thieman, 2008), and is acknowledged as a necessary stipulation by ISTE (ISTE, 2009).

The utilisation of technology as a pedagogical device will not be entirely recognized until there is sufficient accessibility to technological backing and representation in an educational institution (Teo et al., 2011). Though accessibility is usually seen as an external motive, it could have an unswerving influence on the in-house features that either support or dishearten teachers from utilizing technology in the classroom (Starkey, 2010).

2.3.2. Individual attributes

While incorporating technology in the classroom, a tutor's outlook could operate as an obstacle or catalyst, irrespective of the technologies that are accessible to them in the educational institution. Hammond et al. (2011) noticed that those with a more optimistic approach to ICT had the tendency to account for more frequent utilisation of ICT (Lambert & Gong, 2010; Dunn et al., 2011). The teachers' technology efficiency is reliant on skills that are previously present, teacher training course practices, and existing practical knowledge, which combine to determine whether or not ICT is used by teachers to promote student centric learning (Browne, 2009; Ismail et al., 2011; Dunn et al., 2011).

2.3.3. Training:

Chai et al. (2010) reiterates the idea that an inability to elevate the teachers' capabilities while they are in training might lead to teachers to adopt a defeatist attitude towards the utilisation of ICT in their teaching methodology. For several teachers with little educational technologies guidance, and little experience and training with ICT, training is essential to the enhancement of their technological self-efficiency (Chai et al., 2010). In order to be able to make use of ICT, teachers need to be instructed in the essential knowledge, skills and motivation which is required to develop a link between students and technology (Safhi, et al., 2009).

As stated by DeGennaro (2010), the precise representation of technology in curriculum encourages tutors to utilise technology in a positive and student-oriented manner. Chen (2010) further notes that trainee teachers were better equipped to avail and use technology as pedagogical devices in their course if the utilisation of technology was backed and motivated during their training course. The accountability of representation therefore rests on the faculty instructors in teacher training programmes, where their individual expertise and outlook has a pivotal function in the progress of a teacher trainee's technology efficiency (Chen, 2010).

The review of literature further demonstrates that teacher trainees profit from the representation of technology by their faculty instructors added to the valid experiential education and precise tutoring (Duncan & Barnett, 2009; Teo 2009). In a longitudinal investigation that lasted over a period of five years, on the design

samples and suggestions of 223 teachers involved in training and technology programme, Thieman (2008) noted that "tutors have a tendency to utilise the technologies they were trained in" (Thieman, 2008, p. 356). At the end of the investigation, approximately 85% of the investigation's respondents had utilized technology as an educational device with their own students (Sutton, 2011).

Therefore, it can be established that though a student centric use of ICT to promote individual action and cognitive learning, it is difficult for teachers to move away from the established pattern of transmission education and move to student centred learning. This results in increased use of technology as teaching aids or teaching machines. It is also established that the backing given to the teacher in terms of support by the higher education organisation plays a vital role in their ability to use ICT in the classroom. Furthermore, it is observed that an optimistic attitude and self-efficacy of the teacher contribute to technological integration in the classroom. The findings also underline the progressing requirement to initiate teachers with technological devices and educational methodologies in the faculty environment. Teachers will only perceive the importance of technological devices if they are represented by faculty members in their own fields.

2.4. Student engagement:

The millennial learners or the Net Generation are found to live in an atmosphere which is information centric (Windham, 2005). Throughout their life, this generation of learners are exposed to media and technology. This has resulted in an expectation for teachers to use innovative technological tools. These tools are found to be a key aspect in promoting student engagement (Magg, 2006). The computer is an important resource, not only because of its exclusive control capabilities, but because these attributes are also isomorphic with the representations and processes involved in human learning (Osika et al., 2009). It is observed that the use of technological devices like smart phones, iPad has improved both on site as well as off site learning for students (Lai & Wu, 2006), making it important to examine the different factors which impact levels of student engagement.

2.4.1. Student-faculty interaction:

Extant literature (Nicol and MacFarlane-Dick., 2006; Batts et al., 2006) shows that faculty- student interaction is found to have a positive impact on their performance. Chou (2003) further points out that student's adoption of technology is increased when it is used to enhance their learning experience. Young et al., (2003) identified that emails, chats and discussion tools can enable students to interact outside of the classroom, both with their faculty and with other students. It is further observed that the use of ICT tools has enabled prompt feedback from the teachers to the students resulting in acceleration and improvement of learning (Earl 2012). Instead of waiting until the next class in order to clear their queries, students make use of ICT tools to promote discussion and thereby achieve their learning goals.

Management of time is an important tool which is required by students to handle their live assignments (Light 2010). The use of ICT has been proven to foster a learning environment wherein the faculty can provide practice tasks which are time bound and promote submission of material through the internet (Dawson et al., 2010) enabling the faculty to track the length of time spent on an assignment and manage the time-limits (Chou 2003; McCabe and Meuter, 2011).

2.4.2. System interactivity

In ICT mediated learning it is well established that students learn better when there is increased learner interaction with the system (Selim 2007). The level of system interaction by using tools such as the classroom response system, wherein the students were found to be able to communicate with their peers as well as their teachers through electronics, was found to have a positive impact on student performance (Siau et al., 2006). The level of flexibility associated with the system including access to course content, completion of tests online, and ability to turn in homework assignments, are found to promote student use of ICT based learning systems in higher education (Zhang et al., 2004; Moreno and Valdez, 2005).

2.4.3. 1:1 access to technology

The impact of 1:1 access to technology is found to have an impact on student adoption of technology in education (Weston and Bain, 2010). Gronseth et al., (2010) found that one-to-one laptop programs are beneficial ICT technologies which promote the learning versatility of students by enabling effective communication and collaboration. The use of 1:1 technological devices by the 'digital generation' of today is significant, as the goal of these students is to pursue multiple outcomes (Dunleavy et al., 2007). Therefore, the availability of 1:1 technological devices such as laptops, PDA, and computers contribute towards student's use of technology for the purpose of education (Norris et al., 2003; Bebel and O'Dwyer 2010).

2.4.4. Self-Efficacy:

Individual traits and character also assist in deciding whether or not teachers and students are likely to utilise technology in educational institutions (Isman and Celikli, 2009;. Abbad et al., 2009). These 'endogenous and intrinsic' features are comprised of a person's self -efficiency, their approach to technology, and their individual encounter with technology (Sun et al., 2008; Selim 2007). An optimistic approach towards technology involves identification of a person's self-efficiency. Self-efficiency is therefore regarded as a prominent feature impacting technology incorporation.

2.4.5. Technology as source of distraction:

Despite the numerous advantages associated with technology in education it is observed that certain researchers have observed it to be a source of distraction (Wood et al., 2012; Bates and Sangra 2007). In consensus with cognitive load theory, it is observed that when learners engage in activities which are not relevant to the goals of the instructional task that is their focus, then there is decrease in effectiveness of student learning and performance (Dunn et al., 2011). For example, the New York Times (2007) reported that in Liverpool Central School the phasing out of the high school laptop program was initiated due to student abuse of laptops. It has also been documented in a study that instead of prohibiting access to laptops there can be an elimination of internet access in classrooms as observed by the move carried out by University of Chicago Law School (2008)

"*in order to ensure the value of the classroom experience* [because] *students may overestimate their ability to multi-task during class and* […] *some students have expressed distraction due to their peers' use of computers during class time*."

This makes it important to examine the role of technology as a distraction in student performance and engagement.

2.4.6. Learning of different subjects:

The use of ICT differentially for different subjects and its ultimate impact on student engagement and performance. The use of ICT in a classroom environment is found to have a positive impact on improving the language capability of students as it helps engage students through text based simulations, helps in writing and editing process and helps in presenting authentic reviews (Warschuer, 2006). In contrast, the study by Dynarski et al., (2007) showed that the impact of technology did not have a direct impact on teaching outcome. Similarly, Athanasiadis et al., (2011) established that the use of technology has a positive impact of students pursuing arts subjects. The study by de Jong et al., (2008) established that ICT plays a vital role in acquiring knowledge in science and to a lesser degree mathematics. However in contrast Pierce et al., (2007) established that the direct impact of technology on learning mathematics was limited. In the study by Tinker and Krajcik (2001) it is identified that ICT plays a vital role in promoting learning of sciences. Therefore it can be established that the level of student engagement and performance is directly related to the type of subject which is being taught using the technology.

2.5. Organisational factors for promoting technology based education:

2.5.1. Size

Past literature has time after time shown a constructive relationship between institution size and degree of innovation (Rogers, 1995). The most familiar factors for this is the lack of scaling of economies (Kimberly & Evanisko, 1981), improper availability of current resources (Eveland & Tornatzky, 1990), inability to access outside resources (Attewell, 1992), and inability to identify most effective risks (Hannan & McDowell, 1984). Size should also be significant in our circumstance

because institutions which are bigger have better access to technology infrastructure that is essential for providing technology in education.

2.5.2. Organisation and technology fit

An organisation with a high propensity to take up technology may still not do the same. This may be due to the inability of the technology to meet and fit necessity , schemes, reserves, or means. The association between the characteristics of an organisation and the relative fit with adoption of technology has been examined (Boynton et al., 1994).

2.5.3. Cost

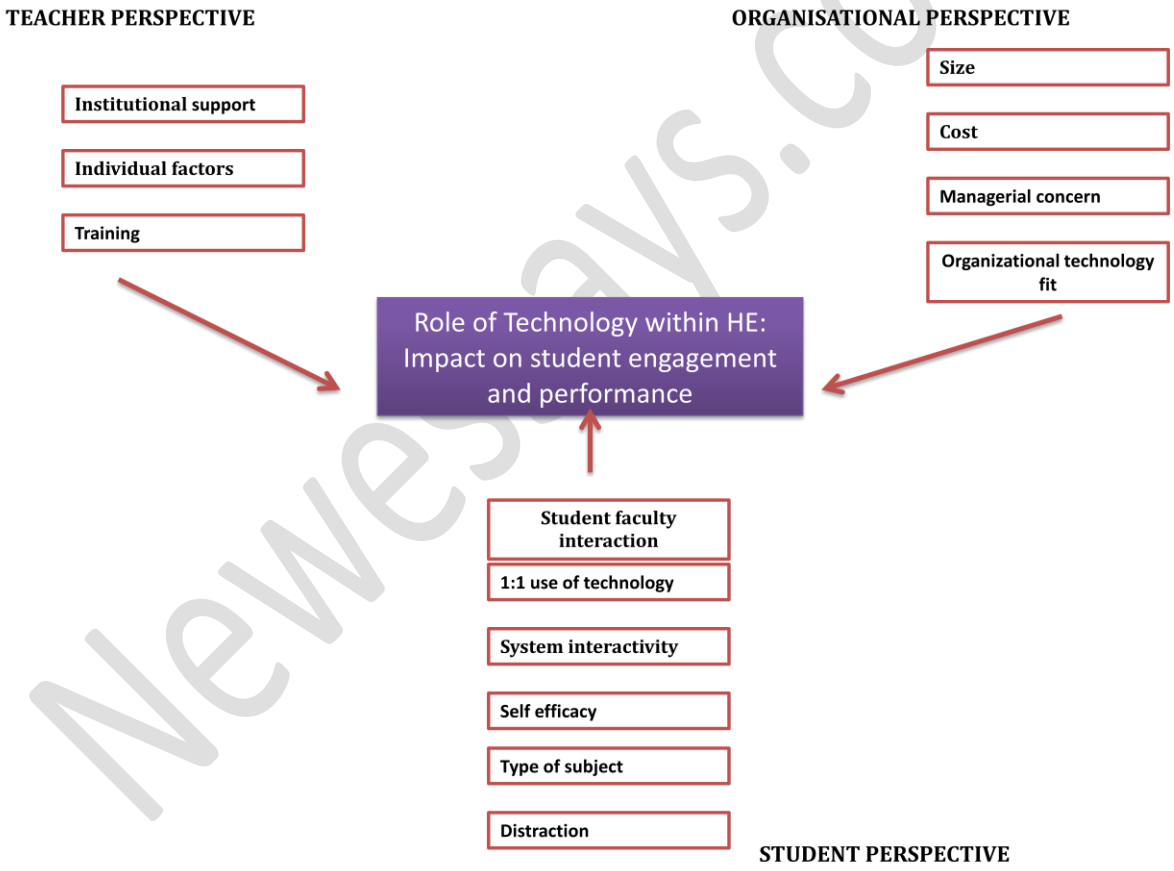
Statistics reveal that among all of the factors that often keep institutions from embarking upon or expanding their technology-based higher education course contributions is the program or course development costs. Zirkle *et al.* (2006), suggest that schools that wish to use education technology should look for external funding sources such as federal or state grants to help with the implementation of such programs. Another way institutions can save on the cost of higher education is by using open source software, such as Moodle, and by exchanging and sharing online courses, instead of reinventing the wheel (Chen, 2009).

2.6. Research Gap:

With the introduction of technical advancement, ICT can be observed as an instrument of transformation and a catalyst of student education. Available evidence regarding the role of ICT, its availability, and increasing access with greater student-gadget proportions and better teacher skills (Hammond, et al., 2009a), does not show a comparable increase in use of ICT by students (Zhang et al., 2004; Seng and Nah 2006). Teachers have an accountability to their present day students to incorporate technology in the classroom, but ability by itself is not sufficient to assist effectual assimilation in tutoring methods (Gao, et al., 2011; Mueller, et al., 2008). While a great deal of literature has examined the impact and role of individual stakeholders with respect to implementation in higher education

there is limited evidence to support the need for a multi-stakeholder approach in order to understand the role of ICT technology in enhancing the student learning experience. The following theoretical framework is proposed by the researcher in this study.,

Figure 1: Theoretical framework of the study



Chapter Three: Research Methodology

3.1. Introduction

The research methodology is helpful in arriving at the proposed research design, and includes data collection methods, sampling as well as measures of data analysis (Creswell and Clark, 2007). This chapter explains the methodology used in exploring the proposed research framework by presenting the ideal design of research which can be implemented in this study (Bryman and Cramer, 2011). Over the years there have been numerous studies which have examined the role of technology in promoting higher education (Selwyn, 2007; Donnelly et al., 2011) from the perspective of the student and/or the instructor. From the previous chapter, it is observed that this study adopts a slightly different approach. Here multi stakeholder views on factors which contribute to the use of technology in higher education and its associated impact on student engagement are identified.

3.2. Research Design

The first step in the research methodology process is the identification of the proposed research design. In this study the different layers of research approach as adopted by Saunders et al., (2009) are examined in the light of the current study objectives.

3.2.1 Research Philosophy

The first step in the research design process is the determination of the research philosophy. The aim of a research philosophy is to help establish the theoretical basis of the research process. This study follows a scientific realism philosophy

which is commonly used in educational research. According to Lodico et al. (2010), in educational research the philosophy of scientific realism helps test previously proposed factors and theories in a specific experimental setting and identify empirical evidences to support the view. This study adopts such an approach to identify if the theoretical framework proposed in Chapter Two can be proven experimentally.

3.2.2. Research Approach

Any research design can adopt either of two different approaches, inductive or deductive. When a study adopts a deductive approach, it tests different theories which have been proposed earlier in order to identify the relationship with the current research objectives. However, when an inductive approach is adopted the available empirical data is examined in order to arrive at theories and hypotheses (Marcoulides, 1998). This study uses deductive approach involving testing of theories and determinants of technology previously established. A similar approach has been adopted in the study by Wood et al. (2012) in order to identify student opinion on the use of technology in class. They tested previously established theories like TRA (Theory of Reasoned Action) and TAM (Technology Acceptance Model) in order to identify student behaviour.

3.2.3. Research Strategy

The third step in a research design is identifying the proposed research strategy. One of three types of research strategy may be adopted in a study. The first strategy involves a quantitative approach. In this strategy the different variables (cause and effect) are examined to establish a statistical relationship by using a purely empirical approach (Saunders et al., 2009). Such an approach has been adopted by researchers, especially those who use an interpretivistic philosophy. In this study, however, the research objective is not just the identification of trends in technology use by students and the factors impacting student use of technology; the study also

aims at understanding the reasons behind these factors by identifying the perspective of the instructors and, more importantly, provide recommendations to overcome any barriers which are identified. This cannot be carried out by presenting a purely quantitative approach (Bryman and Cramer, 2011). In contrast, the aim of a qualitative research strategy is to infer meaning from observations, narratives, ethnographies or case studies in a manner which promotes flexibility as well as theme identification. Since this study makes use of cause and effect variables, a purely qualitative approach is not possible (Silverman, 2010).

Therefore the most suitable research strategy which is adopted in this research is the mixed research approach. In this method there is merging of qualitative and quantitative forms of research. This study identifies the views of the students with respect to the adoption of technology, as well as that of the instructors, by using a mixed research approach (Merriam, 2002). The student views on the role of technology in impacting engagement as well as the determinants of use of technology for learning are identified using a quantitative approach. The instructor opinion on factors impacting instructional design as well as barriers to promotion of technological resources in an institution is examined using a qualitative approach.

3.3. Data Collection

This study adopts a primary data collection method. It is observed that two instruments are used: interview schedule and a survey or questionnaire (Bryman and Bell, 2007). The use of a questionnaire in the study helps to identify the student opinion on technology use in the class room. This method is preferred as it helps reach a greater number of respondents from different streams in a relatively quick and less expensive manner (Zikmund, 2003). This study made use of a web survey approach. The researcher made – web surveys in order to research a wide range of higher education students in UK. This approach not only helped reach out to a number of respondents, but also ensured —– a diversity of response (McMillan and Schumacher, 2006). The questionnaire had two sections. The first section asked basic details of the respondents while the second was made up of statements which required a Likert scale scoring. The most commonly used Likert Scale (Strongly

disagree - Strongly agree) was adopted and a scoring of 1-5 was given (Fowler, 2008).

Following this a personal semi-structured interview schedule was conducted with certain educators in the UK. The adoption of an interview methodology was useful in order to pose complicated open ended questions to identify a greater range of responses (Johnson and Onwuegbuzie, 2010) and thereby establish themes which can be related to the research objectives.

3.3.1. Sampling

Two types of sampling methods were adopted: random snowball sampling and judgement sampling.

In order to reach a number of students from different streams of higher education, the researcher designed the survey and uploaded it on www.surveymonkey.com. Following this the link to the survey was posted in a number of university forums, chat rooms and discussion boards to which the researcher, —— as a student, had access. Furthermore the researcher – made use of social networking websites like the Higher Education UK group on Facebook (https://www. facebook.com/highereducationuk?ref=ts&fref=ts). The students who took part in the survey were requested to recommend the same to their friends. The minimum sample size required for a questionnaire to show statistical validity is 30 (Saunders et al., 2009). The researcher aimed at reaching at least twice that number of students. A total of 110 students were willing to take part in the survey. It was observed that only 82 respondents completed the survey. Hence the sample size for the questionnaire study was 82.

In order to identify the respondents for the interview schedule, the researcher made use of two main groups on a popular professional networking website, LinkedIn.

1. Higher Education Management (http://www.linkedin.com/groups/higher-education-management-129709)

2. International Association of Academic Professionals (http://www.linkedin.com/groups/International-Association-Academic-Professionals-3825795)

The researcher was able to reach out to fifteen different educators who were found to be part of higher education promotion in the UK. Of the fifteen respondents, only five agreed to take part in the study. A Skype interview was arranged with the respondents and permission was sought to record the interviews. The minimum sample size of a personal interview was established as between 4-8 (Saunders et al., 2009), thereby identifying that the sample size of this study is sufficient.

3.4. Data Analysis

The data collected for the questionnaire was coded into an MS Excel file following which analysis was carried out using Statistics Package for Social Science software (SPSS) to identify descriptive and inferential trends (Bryman and Cramer, 2011). The data collected from the interview was coded and a basic thematic analysis was carried out (Creswell and Clark, 2007).

3.5. Validity and Reliability

The validity and reliability of the research instrument was identified by carrying out a pilot study. The questionnaire was pre-tested among five students who were accessed in person by the researcher. These respondents were asked to give constructive criticism about the questionnaire. Based on their opinion, the researcher shortened the length of the questionnaire, modified a few statements which were Yes and No questions to Likert Scaling, and added a short description of the study. The reliability of the questionnaire was carried out using Cronbach's Alpha as observed in the following table. It is observed that the results are above 0.7, indicating an acceptable level of internal consistency between the research items.

Table 1: Reliability analysis

Variables	Cronbach's Alpha
Student-Faculty interaction	0.733
System interactivity	0.981
1:1 Use technology	0.672
Technology distraction	0.820
Technology different subjects	0.936
Self efficacy	0.735
Student engagement	0.819

3.6. Ethical Approaches

The research was designed and carried out in such a manner that the anonymity and confidentiality of – respondents was maintained. All respondents were treated with respect, and the study was made completely voluntary.

3.7. Conclusion

This chapter presented the methodology adopted in this study, which was a research design consisting of a realistic philosophy, deductive approach, mixed strategy and primary data collection approach.

Chapter Four: Results & Discussion

4.1. Introduction

This chapter presents the results of the data collected using the primary data instruments. The results obtained through the questionnaire survey were organised into different tables and the results of the statistical analyses carried out are presented in section 4.2. The results obtained through the interview analysis were subjected to a thematic analysis and this is presented in section 4.3.

4.2. Quantitative Analysis

This section presents the results of the questionnaire.

4.2.1. Student education and perception of use of technology

Table 2: Educational details of students

Degree of student	**Frequency**	**Percentage**
Undergraduate student	52	63.4
Post graduate student	24	29.3
Doctoral student	6	7.3
Total	82	100.0
Stream of education		
Arts and Sciences	35	42.7
Business, Law and Economics	28	34.1
Education	10	12.2
Engineering and Applied Sciences	9	11.0
Total	82	100.0

From the above table it is observed that the majority of students were undergraduates (63.4%), some of them were post graduates (29.3%) and others were doctoral students (7.3%). It was also observed that the majority of students were found to be from the Arts and Science stream (42.7%) and most others in Business, Economics and Law (34.7%). Very few students were found to be from the field of Education (12.2%) and even fewer in Engineering (11%).

Table 3: Impact of technology on student learning enhancement - Association with course of study

Course of study	Enhancement of learning					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total
UG	1	2	3	44	2	52
	33.3%	66.7%	33.3%	95.7%	9.5%	63.4 %
PG	2	1	1	2	18	24
	66.7%	33.3%	11.1%	4.3%	85.7%	29.3 %
PhD	0	0	5	0	1	6
	0.0%	0.0%	55.6%	0.0%	4.8%	7.3%
Total	3	3	9	46	21	82
	100.0%	100.0%	100.0%	100.0 %	100.0%	100.0 %
Chi-square value: 86.57				p-value: 0.001**		

The above table examines the association between student perception of technology use and their course of study. It is observed that the majority of post graduate students (18 students) strongly agreed with the impact of technology on enhancing their learning. The majority of undergraduate students were found to agree with the role of technology on enhancing learning (44 students). However, the doctoral students were found to be neutral with respect to the role of technology. With a Chi-square value of 86.7 and p-value of 0.001 it is observed that there is an association between perception of the role of technology on student learning and their course of study.

Figure 2: Impact of technology on student learning enhancement - Association with course of study

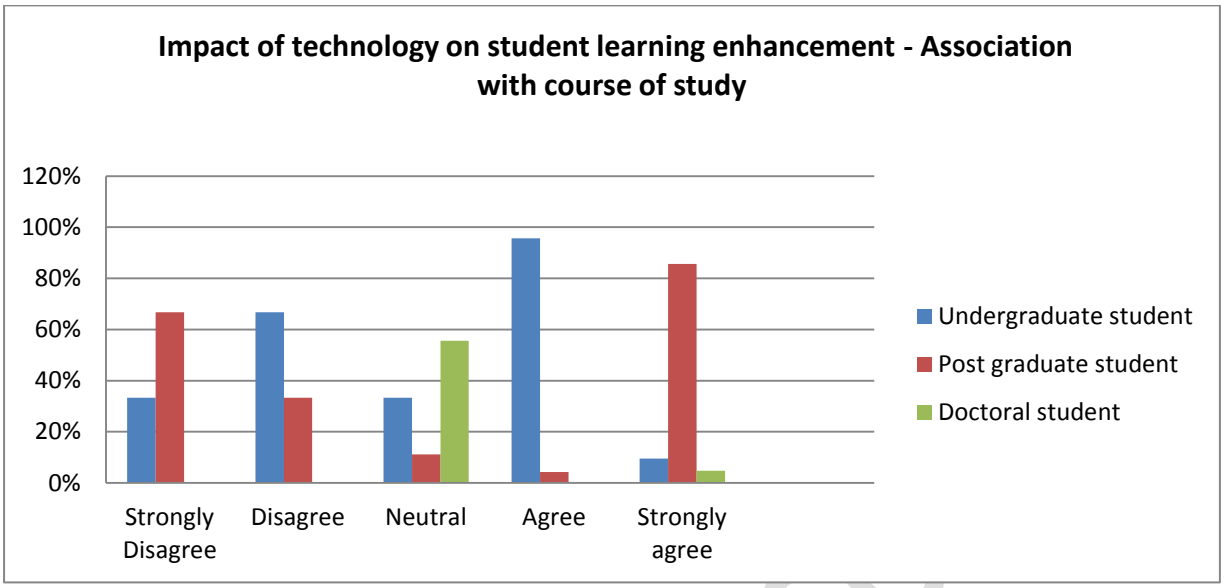


Table 4: Impact of technology on instructor teaching method - Association with course of study

Course of study	Enhancement of instructor teaching methods					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total
UG	3	3	3	40	3	52
	60.0%	60.0%	33.3%	93.0%	15.0%	63.4 %
PG	2	2	1	3	16	24
	40.0%	40.0%	11.1%	7.0%	80.0%	29.3 %
PhD	0	0	5	0	1	6
	0.0%	0.0%	55.6%	0.0%	5.0%	7.3%
Total	5	5	9	43	20	82
	100.0%	100.0%	100.0%	100.0 %	100.0%	100.0 %
Chi-square value: 73.58				p-value: 0.001**		

The above table examines the association between student perception of the use of technology by instructors and their course of study. It is observed that the majority of post graduate students (16 students) strongly agreed with the impact of technology on enhancing instructor teaching methods. The majority of undergraduate students were found to agree (40 students), while doctoral students were found to be neutral

with respect to the role of technology in enhancing teacher instruction methods. With a Chi-square value of 73.58 and p-value of 0.001 it is observed that there is an association between perception of the role of technology on instructor teaching and student course of study.

Figure 3: Impact of technology on instructor teaching method - Association with course of study

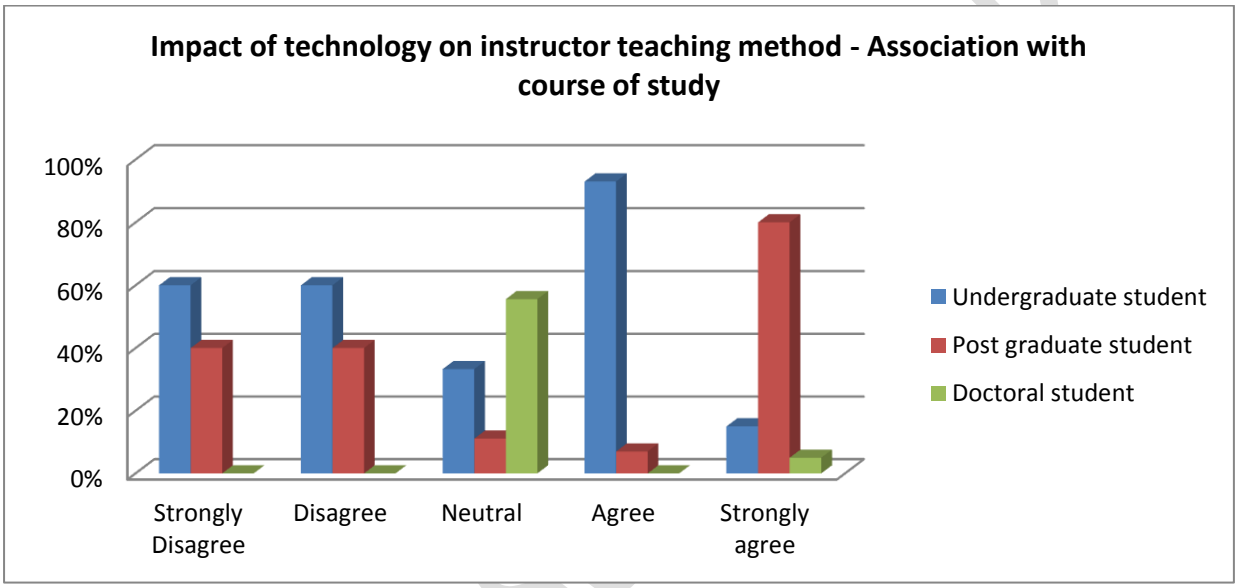


Table 5: Impact of technology on student learning - Association with stream of education

Stream of education	Enhancement of student learning					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total
Arts and Sciences	0	1	2	24	8	35
	0.0%	33.3%	22.2%	52.2%	38.1%	42.7%
Business, Law and Economics	0	1	6	12	9	28
	0.0%	33.3%	66.7%	26.1%	42.9%	34.1%
Education	0	1	0	8	1	10
	0.0%	33.3%	0.0%	17.4%	4.8%	12.2%
Engineering and Applied Sciences	3	0	1	2	3	9
	100.0%	0.0%	11.1%	4.3%	14.3%	11.0%
Total	3	3	9	46	21	82
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chi-square value: 37.02				p-value: 0.20		

The above table examines the association between student perception of technology impact on — student learning and their stream of education. It is observed that the majority of Arts and Science students (24 students), Business and Economics students (12 students) and Education students (8 students) agreed with the impact of technology on enhancing their learning. Since a similar response was observed across all streams no association between the attributes was found.

Figure 4: Impact of technology on student learning - Association with stream of education

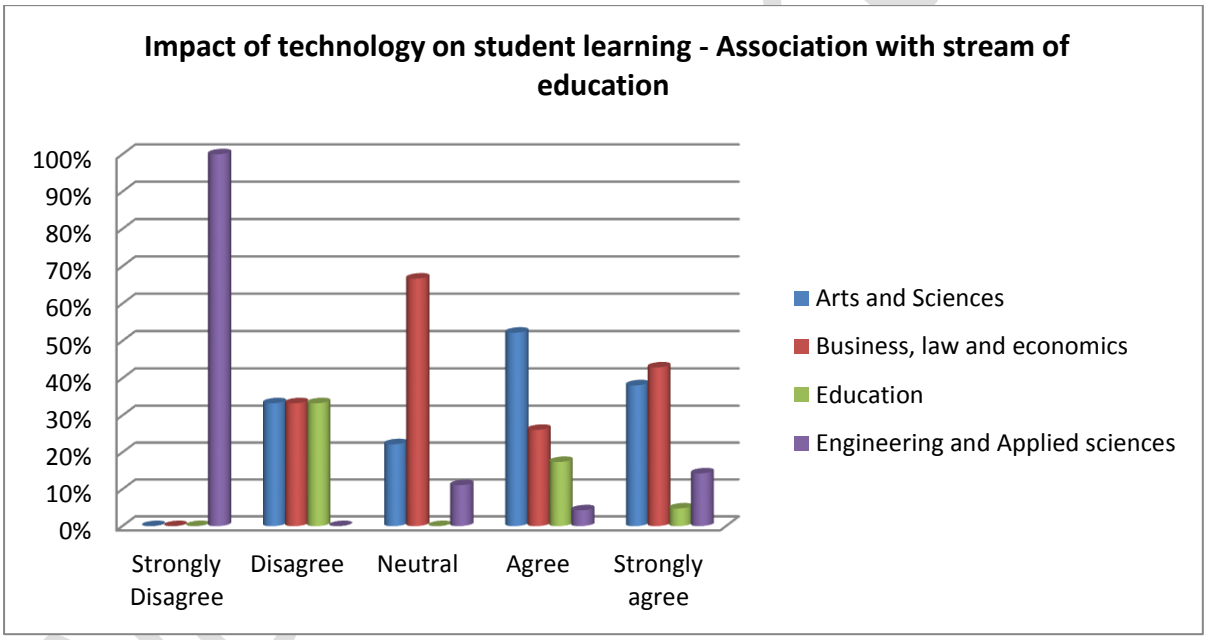
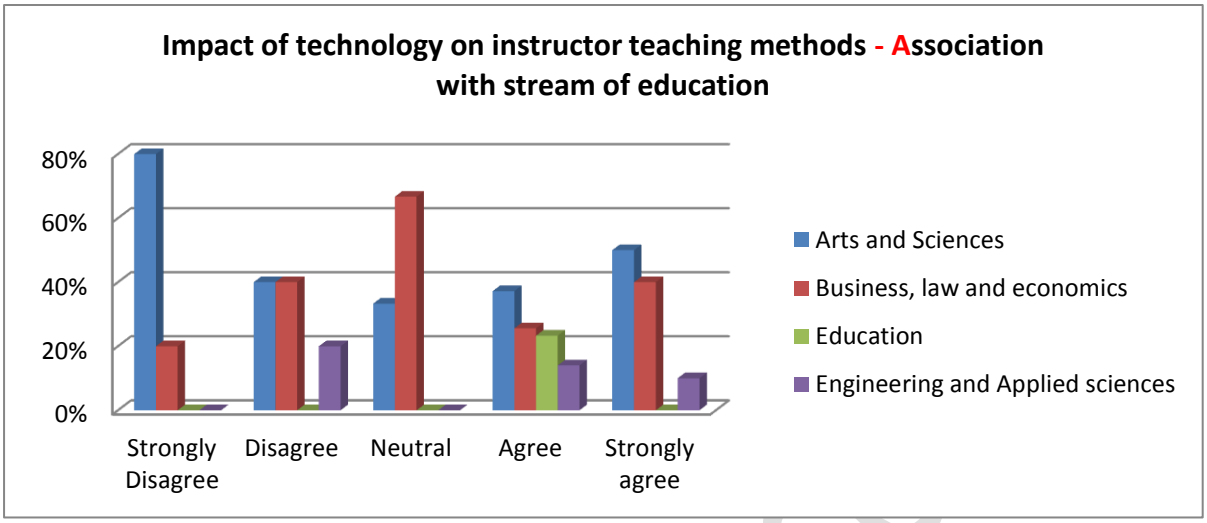


Table 6: Impact of technology on instructor teaching methods - Association with stream of education

Stream of education	Impact of technology on instructor teaching methods					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Total
Arts and Sciences	4	2	3	16	10	35
	80.0%	40.0%	33.3%	37.2%	50.0%	42.7%
Business, Law and Economics	1	2	6	11	8	28
	20.0%	40.0%	66.7%	25.6%	40.0%	34.1%
Education	0	0	0	10	0	10
	0.0%	0.0%	0.0%	23.3%	0.0%	12.2%
Engineering and Applied Sciences	0	1	0	6	2	9
	0.0%	20.0%	0.0%	14.0%	10.0%	11.0%
Total	5	5	9	43	20	82
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Chi-square value: 17.97				p-value: 0.11		

The above table examines the association between student perception of technology impact on instructor methods and their stream of education. It is observed that the majority of Arts and Science students (16 students), Business and Economics students (11 students), Education students (20) and Engineering students (6 students) agreed with the impact of technology on enhancing instructor teaching methods. Since a similar response was observed across all streams no association between the attributes was found.

Figure 5: Impact of technology on instructor teaching methods - Association with stream of education



Lofstrom and Nevgi (2007) studied different perspectives on web-based teaching and learning in higher education and observed that the use of web-based technology was found to be greater among undergraduates than among post graduates. This correlates with the views obtained in this study, wherein a positive association between the role of technology in impacting student learning methods and the course of study is observed. Young et al. (2003), on examination of learning styles of students and instructional technology, identified that there is no association between the use of technological tools and their stream of education. This correlates with the views observed in this study wherein no positive association between the role of technology in education and stream of education is observed.

4.2.2. Determinants of technology use by HE students

Table 7: Descriptive statistics of determinants of technology use

	Mean	Median	Minimum	Maximum	SD
Student-Faculty interaction	3.49	4	1	4	0.593
System interactivity	4.37	4	1	5	0.729
1:1 use technology	3.43	3	1	5	0.648
Technology distraction	3.01	3	2	5	0.619
Technology use in different subjects	1.17	1	1	4	0.584
Self efficacy	4.41	4	2	5	0.647

The above table presents the descriptive statistics in terms of determinants of technology use. It is observed that most of the attributes including student faculty interaction, system interactive, 1:1 use of technology, role of technology as a distraction and self efficacy show an above average mean score. However, the use of technology in different subjects is found to show a below average mean score. All attributes have responses ranging from strongly disagree to strongly agree and show a low standard deviation. The following tables identify the importance of each of these attributes.

Table 8: Impact of technology on student-faculty interaction

Student-Faculty interaction	Mean	SD	t-test	p-value
My lecturer encourages us to make use of technology during class presentations	3.33	.832	3.582	.001
I frequently use the discussion forums on my university webpage to interact with my faculty and other students.	3.34	.835	3.704	.000
I post any queries that I have via email to my lecturer	3.35	.866	3.698	.000
My lecturers make use of technology to present live assignments via the internet	3.51	.920	5.044	.000
My lecturers provide us with mock tests on the discussion forums to enable us manage time better	3.33	.817	3.648	.000
I often submit soft copy of assignments/tests to my lecturers and receive feedback using the same medium	3.37	.896	3.698	.000

The above table examines the role of technology in impacting student-faculty interaction. It is observed that all aspects including use of technology during class presentations (Mean = 3.33 , SD= 0.832), use of online discussion forums (Mean =3.34 , SD= 0.835), use of email to raise queries (Mean = 3.35 , SD= 0.866), taking up live assignments (Mean = 3.51 , SD= 0.920), mock tests (Mean =3.33 , SD= 0.817) and submission of soft copy of assignment (Mean = 3.37 , SD= 0.896) show an above average mean score. This revealed that most of the respondents agreed with the above views or were neutral about the same.

These views can be compared to those in literature. From the literature review, it is observed that emails, chats and discussion tools can enable students to interact outside of the classroom, both with their faculty and with other students (Young et al., 2003). Earl (2012) reiterated the view that use of ICT tools has enabled prompt feedback from the teachers to the students resulting in acceleration and improvement of learning.

Table 9: Role of system interactivity

System interactivity	Mean	SD	t-test	p-value
My university website/discussion forums has an effective learner interface (i.e., has attributes like keyword search and database search).	4.13	1.003	10.237	.000
I can track the status of my grades by using technological resources	4.18	1.090	9.826	.000
My university website/discussion forums provides us with links to other education sites and related learning material.	4.12	1.070	9.493	.000
There are online tools (like quizzes, ppt presentations etc) available to promote self evaluation and help me learn effectively.	4.24	.924	12.193	.000

The above table examines the role of system interactivity in student learning. It is observed that all aspects including presence of effective user interface (Mean = 4.13, SD = 1.003), tracking of grades using technological resources (Mean = 4.18, SD = 1.090), presence of links to educational websites and learning material (Mean = 4.12, SD = 1.070) and presence of online tools (Mean = 4.24, SD= 0.924) are found to show a high mean score. This identified that most of the respondents either strongly agreed or agreed with the above statements.

These views can be compared to those in literature. It is stressed in literature (Selim, 2007) that any ICT mediated learning background requires increased learner interaction with the system. The importance of interaction between students and the technological interface is supported by the views of Kang et al. (2011), who identify that the system interactivity governs the degree of student interest. Furthermore,

McGuire and Castle (2010) support the views of the current study, – presenting the opinion that the use of technology in higher education has enhanced the degree of self learning by students.

Table 10: Role of 1:1 use of technology

1:1 Use of technology	Mean	SD	t-test	p-value
The 1:1 use of technology makes it easier to organise assignments and materials.	3.41	.860	4.366	.000
Using 1:1 has made me read more academic materials and become a better learner.	3.39	.885	3.991	.000
Using 1:1 technology for assignments has made it easier for me to edit work and hand in better quality work.	3.38	.826	4.144	.000

The above table examines the role of 1:1 use of technology in enhancement of student learning. It is observed that all aspects including use of technology to organise assignments (Mean = 3.41, SD= 0.860), better academic knowledge (Mean = 3.39, SD = 0.885) and editing and formatting work (Mean = 3.38 , SD= 0.826) show an above average mean score. This reveals that most of the respondents agreed with the above views or were neutral about the same.

These views can be compared to those in literature. 1:1 use of technology has been found to have an impact on student adoption of technology in education (Weston and Bain, 2010). Bebell and O'Dwyer (2010) examined the role of 1:1 computer setting in enhancing educational outcomes and identified an increase in student engagement. Furthermore Reiser and Dempsey (2011) identified that 1:1 access to technology enables a great deal of improvement in student knowledge promotion.

Table 11: Impact of technology as distraction

Technology as distraction	Mean	SD	t-test	p-value
I think the use of technological devices in classrooms (laptops, PDA) is a source of distraction	3.00	.667	.000	1.000
I think there is misuse of technology use in classroom (e.g. surfing the internet or playing games)	2.23	.806	-8.634	.000
I think eliminating internet access will reduce student distraction	4.17	1.040	10.194	.000

The above table examines the distractive nature of technology. It is observed that most students are ambivalent with regards to the distractive nature of technology (Mean = 3.00, SD = 0.667) with most of them being neutral towards the same. Furthermore the students also disagree with the fact that there is a great deal of misuse of technology in the classroom (Mean = 2.23, SD = 0.806). However, the majority of students agreed that elimination of internet access will reduce distraction (Mean = 4.17, SD = 1.040).

From the views in literature (Duncan et al., 2012) it is observed that most professors or lecturers strongly promote the ideology that technology use in classroom is a distraction. However, the views of the students contradicts this perception. In the current study students think the use of technology in the classroom is a minimal distraction.

Table 12: Technology use in different subjects

Different subjects	Mean	SD	t-test	p-value
I think technology has better impact on learning certain courses when compared to others	1.29	.839	-18.434	.000
I think better educational software and technological assistance is available for certain courses when compared to others	4.39	.843	-10.342	.000
I think uniform use of technology in all courses is possible	1.41	.902	-15.916	.000

The above table examines the use of technology in different subjects. It is observed that most students disagreed with the views that technology had an equal impact on learning of different courses (Mean = 1.29, SD= 0.839) and that uniform use of technology in teaching different courses is possible (Mean = 1.41, SD = 0.902). However, they strongly agree with the greater availability of software for certain courses when compared to others (Mean = 4.39, SD = 0.843). These views can be compared to those in literature.

The studies by Althanasiadis et al. (2001) and Pierce et al.,(2007) have shown that there is a difference in the role technology plays in enhancing student learning when it comes to examination of different subjects. The results of the current study correlate with their view and strongly establishes that technology cannot be used equally in the teaching of all subjects.

Table 13: Self-efficacy with use of technology

Self-efficacy with use of technology	Mean	SD	t-test	p-value
I know how to use technological tools and software applications that are most relevant to my major.	4.23	.934	11.947	.000
I know how to use technology for effective course management.	4.34	.878	13.836	.000
I know how to use technology for writing assignments/tests (using MS word, sharing documents, peer review, editing).	4.15	.995	10.429	.000
I know how to acquire, interpret and use information relevant to my field of study.	4.27	.943	12.173	.000
I am aware of legal and ethical use of information through technological resources.	4.15	.970	10.699	.000

The above table examines the self-efficacy of students with respect to the use of technology. It is observed that all aspects including use of the technology tools

relevant to their major (Mean = 4.23, SD = 0.934), technology use in course management (Mean = 4.34 , SD = 0.878), using technology in writing and editing of assignments (Mean = 4.15 , SD = 0.995), use of technology to interpret information (Mean = 4.27 , SD = 0.943) and awareness of legal and ethical issues associated with use of technology (Mean = 4.15 , SD= 0.970) all show an high mean score. This reveals that most of the respondents agreed or strongly agreed with the same.

These views can be compared to those in literature. Isman and Celikli (2009) and Abbad et al. (2009) identify that individual traits and characteristics assist in deciding whether or not teachers and students are likely to utilise technology in educational institutions. These characteristics include attributes like knowledge of the system, knowledge of the application of the system to their needs, as well as knowledge of ethical use of the system. These views correlate with the results observed in the current study.

Table 14 (below) examines the relationship between the students' course of study and their opinion of the different determinants of technology use. It is observed that five out of six attributes were found to show an acceptable p-value, indicating that there is a relationship between determinants of the role of technology and the course of study of the students.

Table 15 (below) examines the relationship between the students' stream of education and their opinion of the different determinants of technology use. It is observed that four out of six attributes were found to show an acceptable p-value, indicating that there is a relationship between determinants of the role of technology and the stream of education.

Table 14: Difference in opinion across course of study

Determinants	Course of study	Mean	SD	Sig.
Student - Faculty interaction	Undergraduate	3.44	0.608	**.001**
	Post graduate	3.63	0.495	
	Doctorate	3.33	0.816	
System interactivity	Undergraduate	4.27	0.819	**.014**
	Post graduate	4.46	0.509	
	Doctorate	4.83	0.408	
1:1 Use of technology	Undergraduate	3.33	0.678	**.001**
	Post graduate	3.58	0.584	
	Doctorate	3.67	0.516	
Technology as distraction	Undergraduate	3	0.626	**.013**
	Post graduate	3.13	0.537	
	Doctorate	2.67	0.816	
Technology use in different subjects	Undergraduate	1.21	0.667	.407
	Post graduate	1.13	0.448	
	Doctorate	1	0	
Self-efficacy	Undergraduate	4.38	0.631	**.002**
	Post graduate	4.46	0.721	
	Doctorate	4.5	0.548	

Table 15: Difference in opinion across stream of education

Determinants	Course of study	Mean	SD	Sig.
Student - Faculty interaction	Arts and Sciences	3.57	0.502	0.073
	Business, Law and Economics	3.46	0.576	
	Education	3.2	0.919	
	Engineering and Applied Sciences	3.56	0.527	
System interactivity	Arts and Sciences	4.31	0.758	0.07
	Business, Law and Economics	4.46	0.508	
	Education	4.1	1.197	
	Engineering and Applied Sciences	4.56	0.527	
Use of technology	Arts and Sciences	3.29	0.75	0.001
	Business, Law and Economics	3.5	0.509	
	Education	3.5	0.707	
	Engineering and Applied Sciences	3.67	0.5	
Technology as distraction	Arts and Sciences	2.91	0.562	0.192
	Business, Law and Economics	3.04	0.693	
	Education	3.3	0.823	
	Engineering and Applied Sciences	3	0	
Technology use in different subjects	Arts and Sciences	1.17	0.618	0.323
	Business, Law and Economics	1.07	0.262	
	Education	1.5	1.08	
	Engineering and Applied Sciences	1.11	0.333	
Self-efficacy	Arts and Sciences	4.43	0.698	0.024
	Business, Law and Economics	4.43	0.69	
	Education	4.2	0.422	
	Engineering and Applied Sciences	4.56	0.527	

4.2.3. Impact of determinants of technological use on student engagement

Table 16: Impact on student engagement

Independent	Unstandardised Coefficients		R - Square	F-value	t-test	p-value
	B	Std. Error				
(Constant)	-.790	.428			-1.847	.069
Student Faculty interaction	.262	.064			4.131	.000
System interactivity	.226	.054			4.213	.000
1:1 Use technology	.209	.059	0.572	16.699	3.531	.001
Technology distraction	.137	.061			2.229	.029
Technology different subjects	.209	.066			1.147	.120
Self-efficacy	.198	.059			3.372	.001

Dependent variable: student engagement

The above table examines the relationship between different determinants of technology use by students and student engagement. It is observed that different attributes including student faculty interaction (β = 0.262, p-value = 0.000), system interactivity (β = 0.226, p-value = 0.000), 1:1 use of technology (β = 0.209, p-value = 0.001), technology as a distraction (β = 0.137, p-value = 0.029) and self-efficacy (β = 0.198, p-value = 0.001) are found to impact student engagement. From the above model it is observed that the degree of technology use in different subjects is not found to be a factor impacting the level of student engagement.

These views can be compared to those in literature. The importance of technology in promoting student faculty interaction and the associated student engagement is presented by Sheng et al. (2010). Similarly Wainsworth and Bain (2010) reiterate the view that 1:1 use of technology enhances student academic engagement.

Furthermore Kulesza et al. (2011) identify that there is a negative aspect associated with technology impact on student engagement in the form of distraction.

4.3. Qualitative analysis

4.3.1. Different factors which impact faculty use of technology in education

When the instructors were questioned about the most important factors which impacts on the use of technology in instructional design, two main attributes were identified. Some educators identified that the instructor attitude towards teaching was the most important factor. This is observed from the following statements:

INST1: "I think the most important determinant is the instructor's attitude. The students who come to class are from a digital age. I think having a positive attitude towards the use of technology will help me communicate with my students better."

INST4: "The teacher's efficacy in handing technology as well as their attitude towards the same is the most important factor. I have some colleagues who feel that technology use distracts their students. I, however, strongly feel that the use of technology has helped me provide a more interactive learning environment for my students".

The other factor which was identified included the degree of institutional support. This is observed from the following statements:

INST3: "I think the degree of use of technology by any instructor is dependent on the degree of accessibility provided to them."

INST2: "I think the support I receive from my department head and my organisation is the most important factor."

Role of institutional support

All the instructors strongly identified with the support given by their institution with respect to the use of technology in the classroom. This is reiterated in the following statement:

INST4:" My institution strongly supports the use of technology in classroom. Recently, the use of technology has been supported not only as a teaching method but also as a measure to develop instructional design."

This has been countered by the view of another respondent:

INST5: "Though there has been a great deal of support to use technology in the classroom, I find limited support to develop teaching modules and instructional designs.

The importance of institutional support by provision of different equipment has been stressed by a few instructors:

INST1: "I have access to interactive white boards, projectors and video cameras. This helps me provide real time experience of certain modules I teach to my students."

INST2: "The access to different databases via the university website is a boon for instructors as we are able to access peer reviewed journals and provide our students with updated academic knowledge."

These views are supported by the literature review. From the study by Starkey (2010) it is observed that the availability of technology helps provide access to real time and updated information.

Role of teacher efficiency and teacher interest

All instructors strongly identify with the view that teacher efficiency plays a vital role in impacting on the use of technology in classrooms.

INST2: "In my opinion the tutor outlook is the most important aspect, as mentioned before."

INST1: "I think teacher efficiency in understanding the ever changing technology is the most important."

INST4: "I think teacher attitude towards using technology as a part of their teaching process, will help promote student centric learning."

These views are supported by those in literature. According to Browne (2009) the teacher's attitude and efficiency with technology helps promote student centric learning. Furthermore Dunn et al., (2011) identifies that the instructor's outlook on technology will enable modernisation of their teaching methods and will promote faculty student interaction.

Role of training

When the instructors were questioned about the amount of training they received, mixed opinion was observed. Some instructors indicated that some basic training was provided by their institutions, while others identified that it was something they learnt by themselves.

INST1: "No, I did not receive formal training. I learnt it as and when I applied it. However, I think it is very important"

INST4: "No formal training was given to me. The internet is a wonderful source to learn how to use different technology tools as pedagogical sources. In future giving training to new teachers would be most useful".

INST2: "I have received some training. However, I think that is because I belong to a new generation of teachers who had IT training as part of our teacher education programmes".

INST5: "I think the training programme given by my institution has helped me improve my skills."

These views can be compared to literature. For several teachers with little educational technology guidance, and little experience and training with ICT, training is essential to the enhancement of their technological self-efficiency (Chai et al., 2010).

4.3.2. Barriers to use of technology in education at an institutional level

Different barriers were presented by the interviewed instructors when considered from an institutional level. These include organisational size, funding and the requirements.

INST1: *"Considering the institution, I think size is an important factor. The size of the institutions automatically translates to the availability of funding and human capital available to implement technology."*

INST2: *"Smaller institutions find it difficult to adopt technology, while bigger universities can."*

INST4: *"In my opinion the main barriers to technology implementation on an institutional level are the funding and level of fit. Unless the resources and capabilities are required by an organisation, it may not be implemented."*

INST5: "*Despite the presence of other barriers, I would say that the most important factor is the cost. For an institution to implement extensive technology, funding is required."*

INST3: "Funding for better equipment and resources is another important barrier."

These views are supported by those observed in literature. From the study by Selwyn (2007) it was observed that lack of effective implementation of technology-

based education in a number of institutions is due to several barriers associated with the same. These include need for better managerial skills as well as the need to raise the necessary funding.

4.4. Conclusion

The above chapter has discussed the results obtained from the primary data collection instruments, the questionnaire and interview. The results obtained are compared with those in literature and conclusions have been arrived at with respect to determinants of student use of technology, impact of determinants on student engagement, factors influencing faculty use of technology and barriers to implementation of technology in higher education. The following chapter concludes the study by presenting the research implications, recommendations and limitations.

Chapter Five: Conclusion

5.1. Introduction

This chapter presents the conclusion to the study by presenting study implications, study recommendations, future research directions and limitations.

5.2. Study implications and recommendations

The implications of the study are presented keeping in mind the proposed research objectives.

Determinants of technology adoption by students within university level higher education

From the study results in section 4.2.2, it is observed that different factors including student-faculty interaction, system interactivity, 1:1 use of technology as well as student self-efficacy all determine student the degree of use of technology inside and outside the classroom in order to enhance learning. These results were substantiated by those in literature. Sime and Priestley (2005) examined the role of technology in enhancing teaching methods among a group of student teachers. Their study showed that all teachers were found to promote the use of technology irrespective of their target student course. This contradicts the views observed in the current study, wherein no positive association between the role of technology in impacting teaching methods and the course of study was observed. —, The researcher attributes this occurrence to the fact that the students were asked to give opinion on instructor methods and not the instructor themselves. The students' perception of the attribute and the actual occurrence need not necessarily be the same. Beaudoin (2013), however, presents the view that in the digital age, the instructor's use of technology in the classroom will enhance the quality of education

and is most essential across all forms of education: primary, secondary and tertiary. It is recommended that all universities undertake efforts to promote these aspects.

The role of technology as a distraction is not agreed upon by students. This conflicts with the opinion of the lecturers. Mixed views in literature are observed in relation to this aspect. Duncan et al., (2012) provided empirical evidences which presented technology as a distraction in the classroom. However, Wood et al. (2012) identify that the use of technology by students in the classroom is not a distraction but promotes multitasking. This is reiterated by the views of Weston and Bain (2010). Therefore it is recommended that this conflict in opinion be resolved, by promoting use of technology like PDA or laptops in class with limited access to the internet by disabling wireless connections inside the classroom. Similarly students also feel that technology is not uniformly used among different subjects. Therefore, it is recommended that different department heads are consulted to increase the availability of technological support to all subjects and identify various software programs which will promote the same.

Role of technological applications in maintaining student engagement

From the study results in section 4.2.2, it is observed that different factors including student-faculty interaction, system interactivity, 1:1 use of technology, technology as distraction and student self-efficacy all determine student engagement in a subject. It is recommended that these factors should be developed from the perspective of improving student engagement. This will enable development of future strategies for technology related applications with a focus on improvement of student engagement.

Impact of technological applications on instructional design and barriers to technological innovation

The views of the interviewees reiterated the fact that the most important factors which impact the use of technology in instructional design include the instructor attitude and the degree of institutional support provided. Thieman (2008) identified that institutional support helps assist teachers in designing their own tailor made course modules and instructional designs. However, according to Teo et al., (2011) the utilisation of technology as a pedagogical device will not be entirely recognised

until there is sufficient access~~ibility~~ to technological backing and representation in an educational institution. Therefore it is recommended that universities look at measures to promote the use of technology as a pedagogical tool in order to arrive at instructional design measures. Furthermore the importance of training in technology for instructors has been identified. It is recommended that universities take measures to provide training programs for their trainers once every year to inform them of the latest available technologies which can be used in order to promote student education.

From the interview results (section 4.3), it is observed that the most commonly cited barriers to promotion of the use of technology include the size of the organisation, lack of effective organisational fit, lack of access, as well as – problems associated with ineffective human capital. Selwyn (2010) identified that the most important aspect which governed the implementation of technology in Higher Education involved the degree and level of requirement of the institution. Some institutions which have larger research departments and a greater number of courses may require more technological tools when compared to smaller institutions. Furthermore it has been established by Donnelly et al., (2011) that – the access~~ibility~~ to technology is another factor which acts as an important barrier. It is recommended that universities in the UK present their needs to the government in order to obtain more funding for the purpose of improving the skills set of the students and transforming them into a talented workforce.

5.3. Limitations and future recommendations of the study

- This study has aimed at reaching a diverse set of respondents to present a generalised opinion on the role of technology in the promotion of Higher Education. However, the limited sample size indicates that this purpose was not met . In order to promote the generalisability of the results it is proposed that future research is carried out by increasing the research sample population.

- In order to identify more targeted results and recommendations, it is suggested that a case study approach be adopted in the future. Recommendations can be identified which are specific to the university in terms of barriers and challenges.
- This research adopted a measure wherein educators were questioned about the barriers faced at institutional level. They may not be aware of all problems. It is suggested that respondents at a managerial level in educational institutions and Government education departments are targeted to identify the barriers. This will facilitate arrival at more targeted solutions.

5.4. Conclusion

Recognising the advantages of ICT, the common expectation in educational organisations globally is that teachers will include technology in their courses and instructional designs (Chen, 2010; Teo, 2009). From the study it is established that student perceptions and teacher views on the role of technology in Higher Education are important to identify benefits, challenges and barriers. It is further observed that organisational strategies and technology accessibility are two interconnected features that influence the use of technology in Higher Education, as any changes associated with the organisational objectives and strategies influence the kind of technology made available to students and teachers. These strategies face certain difficulties with respect to implementation.

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APPENDIX I: The role of technology within Higher Education: Questionnaire for university students

The aim of this survey is to understand how new technologies are affecting teaching and learning of higher education. Your responses will play a crucial part in understanding current trends and help set the future direction for the use of academic technologies. We estimate that it will take you about 10 minutes to complete this survey. Thank you for your cooperation.

(The following questions refer to your course and stream of education. Kindly identify your choice by placing an X in the appropriate box)

1. Course of study

☐ Undergraduate student
☐ Post graduate student
☐ Doctoral student

2. Stream of education

☐ Arts and Sciences
☐ Business, law and economics
☐ Education
☐ Engineering and Applied sciences
☐ Others (specify)

2. Please rank the extent to which you agree with the following statements.

Overall, technology has enhanced my learning.

☐ Strongly agree
☐ Agree
☐ Neutral
☐ Disagree
☐ Strongly disagree

Overall, technology has enhanced my instructors' teaching.

☐ Strongly agree

☐ Agree

☐ Neutral

☐ Disagree

☐ Strongly disagree

Section B:

The following statements identify the role of technology in promoting your educational experience. Kindly identify the level of agreement with the following statements. The following scoring is followed through this entire section.

Student faculty interaction

	1	2	3	4	5
My lecturer encourages us to make use of technology during class presentations					
I frequently use the discussion forums on my university webpage to interact with my faculty and other students.					
I post any queries that I have via email to my lecturer					
My lecturers make use of technology to present live assignments via the internet					
My lecturers provide us mock tests on the discussion forums to enable us manage time better.					
I often submit soft copy of assignments/tests to my lecturers and receive feedback using the same medium.					

System interactivity

	1	2	3	4	5
My university website/discussion forums has an effective learner interface (i.e., has attributes like keyword search and database search).					
I can track the status of my grades by using technological resources					
My university website/discussion forums provides us with links to other education sites and related learning material.					
There are online tools (like quizzes, ppt presentations etc) available to promote self evaluation and help me learn effectively.					

1:1 use of technology

	1	2	3	4	5
The 1:1 use of technology makes it easier to organize assignments & materials.					
Using a laptop regularly has made me read more academic materials and become a better reader.					
Using 1:1 technology for assignments has made it easier for me to edit work and hand in better quality work.					

Technology as distraction

	1	2	3	4	5
I think the use of technological devices in classrooms (Laptops. PDA) is a source of distraction					
I think there is misuse of technology use in classroom (e.g. surfing the internet or playing games)					
I think eliminating internet access by promoting use of laptops will reduce student distraction					

Technology use in different subjects

	1	2	3	4	5
I think technology has better impact on learning certain courses when compared to others					
I think better educational software and technological assistance is available for certain courses when compared to others					
I think uniform use of technology in all courses is possible					

Self efficacy

	1	2	3	4	5
I know how to use technological tools and software applications that are most relevant to my major.					
I know how to use technology for effective course management.					
I know how to use technology for writing assignments/tests (using MS word, sharing documents, peer review, editing).					
I know how to acquire, interpret and use information relevant to my field of study.					
I am aware of legal and ethical use of information through technological resources.					

Student engagement

	1	2	3	4	5
The use of technology has increased my enthusiasm about projects and learning.					
Using a technology tools (computers, laptops, internet) helps me focus more on a lesson and produce better results.					
The use of technology has enabled a more individualized learning experience for me in class.					

Thank you for taking part in the survey

APPENDIX II

Interview Schedule

The aim of this interview is to understand how new technologies are affecting teaching and learning of higher education. Your responses will play a crucial part in understanding current trends and help set the future direction for the use of academic technologies. Thank you for your cooperation.

1. What are the different factors which impact faculty use of technology in education?
2. How effective is your institutional support in promotion of technology use in classroom?
3. Do you think teacher efficacy, teacher interest and other such individual attributes impact use of technology in classroom?
4. How much of training did you receive in terms of use of technology in classroom? How important is this training?
5. What are barriers which are observed at an institutional level which impact the adoption of technology in education?