

**USE AND ACCEPTANCE OF INFORMATION AND  
COMMUNICATION TECHNOLOGIES (ICTS) BY UNIVERSITY  
STUDENTS: DEVELOPING A MODEL FOR THE SRI LANKAN  
CONTEXT**

**BY**

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**May/2015**

## **DECLARATION OF THE CANDIDATE**

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I declare that the study, **Use and acceptance of ICTs by university students: developing a model to the Sri Lankan context** is my own work and the thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree.

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## ABSTRACT

Information and Communication Technology (ICT) is an umbrella term that covers all technologies in retrieving and communicating information and it has turned the world into a global village enabling the compression of time and space. This circumstance has led to a paradigm shift in higher education of Sri Lanka in an effort to capture ICTs to a large extent, as it is the foremost important method to create a technology-equipped generation as effective users of ICTs to cope with the present job market demands. However, literature reveals a lack of sufficient interest in individual use and acceptance of ICTs among Sri Lankan university students. Many researchers in other countries have studied and proposed theories and models on individual use and acceptance of technologies to facilitate predicting individual user behavior with technology over a rapid change in both technologies and their environments. Each theory or model consists of different sets of determinants and moderators exclusive to their own countries. It is therefore questioned whether these theories and models can be used in outside contexts, especially in countries like Sri Lanka. Many researchers have also found that individual cultural values have a strong contextual influence on individual use and acceptance of ICTs. Therefore, the current research aims at proposing a parsimonious and a robust model, which best describes the individual use and acceptance of ICTs among university students in Sri Lanka with the intention of promoting usage and future acceptance. The research study involved a combination of positivist and phenomenological inquiries that led to the use of qualitative and quantitative approaches. The design of the study consisted of two main phases: the exploratory study and the main study. The exploratory study was carried out to check the feasibility of the research and the main study, tested the conceptual model using structured questionnaires from 1681 of university students. Statistical analysis methods and Structural Equation Modeling were employed with SPSS version 21 with AMOS to analyze data. The model developed, ICT Use and Acceptance Model (ICTUAM), was finalized with an excellent model fit. Performance expectancy and facilitating conditions are the determinants which describe the current ICT usage behavior and the performance expectancy, effort expectancy, social influence and current usage behavior play important roles in determining the behavior intention to future use of ICTs. Masculinity/femininity moderated the relationship between performance expectancy and current usage behavior. Power distance moderated the relationship between performance expectancy and the behavior intention to future use of ICTs. The relationship between the social influence and behavior intention to future use of ICTs was moderated by the main subject stream, masculinity/femininity, individualism/collectivism and uncertainty avoidance. Individualism/collectivism moderated the relationship between effort expectancy and behavior

intention to future use of ICTs. The model is a useful tool to suggest strategies to improve the use and acceptance of ICTs to gain skills and thereby contribute to accrue higher dividends for the individuals as well as the society as a whole.

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## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ADSL	Asymmetric Digital Subscriber Line
AIC	Akaike Information Criterion
AMOS	Analysis of Moment Structures
ANOVA	Analysis of variance
BI	Behaviour Intention
CDT	Cognitive Dissonance Theory
CFI	Comparative Fit Index
CINTEC	Computer and Information Technology Council of Sri Lanka
CLC	Computer Learning Center
COMPOL	National Computer Policy for Sri Lanka
CRC	Computer Resource Center
C-TAM-TPB	Combined TAM and TPB
DF	Degrees of Freedom
DTPB	Decomposed Theory of Planned Behavior
ECT	Expectation Confirmation Theory
EDT	Expectation Disconfirmation Theory
EE	Effort Expectancy
ELTU	English Language Teaching Units
FC	Facilitating Conditions
FGD	Focus Group Discussion
GCE	General Certificate of Examination
GFI	Goodness- of- Fit Index
HETC	Higher Education for Twenty first Century
HSPA	High Speed Packet Access
IBM	International Business Machines corporation
IC	Individualism-Collectivism
ICT	Information and Communication Technology
ICTA	Information and Communication Technology Agency of Sri Lanka
ICTUAM	ICT Use And Acceptance Model
IDT	Innovations Diffusion Theory
IS	Information System
ISP	Internet Service Provider

IT	Information Technology
LEARN	Lanka Education and Research Network
MF	Masculinity-Femininity
MIS	Managing Information Systems
ML	Maximum likelihood
MM	Motivational Model
MoE	Ministry of Education
MPCU	Model of Personal Computer Utilization
MPhil	Master of Philosophy
MS	MicroSoft
NFI	Normed Fit Index
NNFI	Non-Normed Fit Index
NREN	National Research and Education Network
O/L	Ordinary-Level
PD	Power Distance
PE	Performance Expectancy
PGFI	Parsimony Goodness-of-Fit Index
PhD	Doctor of Philosophy
RMSEA	Root Mean Square Error of Approximation
SCT	Social Cognitive Theory
SEM	Structural Equation Modelling
SEUSL	South-Eastern University of Sri Lanka
SI	Social Influence
SLT	Sri Lanka Telecom
SMC	Squared Multiple Correlations
SN	Social Norms
SPSS	Statistical Package for the Social Sciences
SQL	Structured Query Language
SRMR	Standardized Soot Mean Square Residual
TAM	Technology Acceptance Model
TCP/IP	Transmission Control Protocol/Internet Protocol
TLI	Tucker-Lewis Index
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

TTF	Task-Technology Fit
UA	Uncertainty Avoidance
UB	Use Behavior
UCTIT	University students Competency Test for Information Technology
UGC	University Grant Commission
UK	United Kingdom
ULS	Un-weighted Least Squares
UNESCO	United Nations Educational, Scientific and Cultural Organization
USA	United State s of America
UTAUT	Unified Theory of Acceptance and Use of Technology
VLE	Virtual Learning Environments
WAN	Wide Area Networks
WIMAX	Worldwide Interoperability for Microwave
WWW	World Wide Web



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# CHAPTER 1

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## INTRODUCTION TO THE STUDY

### 1.1 INTRODUCTION

This chapter provides an overview of the study. It initially presents the background to the study in detail. Then the problem statement explains why an analysis of the use and acceptance of ICTs by university students is needed in the Sri Lankan context. It also presents the theoretical perspectives, a brief review of the past studies, research aim and objectives, significance and scope of the study, originality of the research, operational definitions, methodology, contribution and the structure of the thesis.

### 1.2 BACKGROUND OF THE STUDY

Studying the environment of an individual's use of information technology has been a goal of Managing Information Systems (MIS) research since the mid-1970s, when organizations and researchers found that the adoption of novel technology was not living up to expectations (Compeau & Higgins, 1995). Therefore, technology adoption is now one of the most mature streams specifically in Information Systems research (Vessey, Ramesh, & Glass, 2002; Venkatesh, Morris, Davis, & Davis, 2003; Straub & Burton-Jones, 2007; Brown, Dennis, & Venkatesh, 2010). Two other major disciplines have also contributed to the development of models and theories addressing technology use, future acceptance and adoption: Psychology and Sociology. These disciplines focus on technology use and acceptance behavior, whereas Information Systems focuses on systems' characteristics in relation to technology acceptance. One of the benefits of such maturity is the availability of frameworks and models that can be applied to the study of relevant emerging problems.

ICT can be defined as a "diverse set of technological tools and resources used to communicate, to create, disseminate, store, and manage information" (Blurton, 1999). These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony (Tinio, 2002). While the older technologies such as the radio and television are now given less attention, computers and the Internet have become more prominent. However, the most prominent mechanism is the smart phones which couple wireless networks and mobile communications with personal computing devices and present new means for the 21<sup>st</sup> century technological revolution. Therefore, computer application software and the Internet application tools and resources used to communicate, and to create, disseminate, store, and manage

information which access via desktop computers, laptop computers, the Internet enabled smart phones and other handheld devices is considered as ICTs for the current study and their current use and future acceptance is examined.

ICT adoption is therefore often studied in various contexts; their use, future acceptance, factors affecting their use and acceptance etc. With the ongoing development of ICTs and the diversification of the fields it affects, various theoretical studies have been carried out in order to ensure a better understanding of its diffusion, adoption, usage and acceptance (Rogers, 1983; Davis, 1989; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Wang, Wu, & Wang, 2009). As such, technology acceptance research is a constantly developing field, as new technologies keep evolving all the time. Therefore, the same studies may not be relevant as they will not be constant across time and in different contexts.

According to the literature review, there has been very little effort to investigate the use and acceptance of ICTs from a theoretical perspective in university settings. Due to the non-availability of such specific studies, especially in Sri Lanka, the current research aims to fill this gap by examining the use and acceptance of ICTs of university students, while at the same time developing a parsimonious and a robust model which can best describe the use and acceptance of ICTs by university students in the Sri Lankan context.

### **1.2.1 ICT background**

ICTs have quickly become a crucial part of our global society and is dramatically transforming the world, facilitating innovation and productivity increases, connecting people and communities, and improving standards of living and opportunities across the globe (Dutta & Mia, 2011) enabling the compression of time and space. This circumstance has led to a paradigm shift in education capturing ICTs in a large degree, as it is the foremost important method to create a technology equipped generation (Aryasinha, 2002; Godamanna & Jayamaha, 2013).

#### **1.2.1.1 ICT evolution of Sri Lanka**

Sri Lanka has a long history of ICT development, beginning with the formulation of the National Computer Policy for Sri Lanka (COMPOL) in 1983 which identified key areas of development in the use of computers. Then the Computer and Information Technology Council of Sri Lanka (CINTEC), which later became the Council for Information Technology was established in 1984 in the Ministry of Higher Education and Information Technology Development on the recommendations of CINTEC. This was entrusted to make policy recommendations regarding ICTs use in the country and monitor developments and achievements. Later, under the ICT Act

No. 27 of 2003 the CINTEC was transferred to the Information and Communication Technology Agency of Sri Lanka (ICTA). ICTA was established to set out the e-Sri Lanka vision to harness ICT as a lever for economic and social advancement.

The first attempt of Sri Lanka in ICT adaptation occurred in 1960's (Aryasinha, 2002). As Ranasinghe (2004) highlighted, the ICT adaptation took place at a very slow speed in its first phase and limited IT facilities were available only in selected government institutes such as the Department of Census and Statistics. The process has further accelerated since 1991 after the establishment of Sri Lanka Telecom (SLT). The Internet access on a commercial basis became available in Sri Lanka for the first time in 1995 (Reddi & Sinha, 2004). SLT initiated its Internet service facility in 1996. Thereafter Private Internet Service Providers (ISPs) emerged and there were about 4 fixed line ISP operators (1 ADSL, and 3 WIMAX) and 4 mobile broadband operators (HSPA – 3G+) by 2012 in Sri Lanka (Amarasinghe, 2012). Computers were used widely in the private sector for business applications with varying degrees of Internet connectivity and speed (Reddi & Sinha, 2004). The present ISPs cover a broad geographical area, and the Internet and e-mail with good connectivity are available. As a result, Sri Lanka has increased the Internet penetration to 11.8% by December 2011, with an estimated 2.5 million Internet users. About 13% of the population aged 5 to 69 years has used the Internet facility at least once during the last twelve months (Statistics Sri Lanka, 2009). The urban sector, where the facilities are commonly available, shows a higher use of the Internet than the non-urban sectors.

At the same time, computer ownership at household level has increased rapidly in Sri Lanka. According to the Statistics Sri Lanka (2009), the household computer availability in the urban sector is 23.6%, where a computer is available in one out of every four households and it is much higher than in the rural sector which is 9.2% and the estate sector at 3.1%. However, the rural sector shows a higher percentage of acquisition from 2005 to 2009 with 75% than the urban sector with 66%. Even though, as mushrooming computer vendors and training centres increase, computer usage is spreading all over the country, there exist significant differences in computer awareness across the sectors. The highest computer awareness of 60% is reported from the urban sector households and the lowest awareness of 15.8% is reported from the estate sector. Moreover, there exists a heightened urban/rural disparity with respect to access to the computer and the Internet in Sri Lanka, and public Internet facilities are also limited.

The programs planned under e-Sri Lanka vision aspire to encourage Sri Lankan citizens to exploit ICTs. The overall situation for ICTs in Sri Lanka has visibly improved within the last two

decades. The Internet usage has grown steadily in Sri Lanka in the recent past. According to the “Internet world stats: Usage and population statistics (2011)”, there were 1,776,200 Internet users as of June, 2010 representing 8.3% of the population. According to the ICT market analysis (2008), the total number of Internet users in Sri Lanka expanded at a growth rate of 40.2% during 2004-2007. Sri Lanka is in the 5<sup>th</sup> place among the countries that progressed in computer literacy and ICTs within a very short period in the Asian region. Accordingly, during the last five years the computer literacy in the country has increased from 4% to 30%. However, this percentage for Sri Lanka is still low. It seems that Sri Lanka is far behind the rest of the world in ICT penetration (11.8% at December 2011) despite most of the population being able to read and write. Researchers have identified that the concentration and utilization of ICT facilities in the rural sector is extremely low as compared to many developed and developing countries, Sri Lanka’s level of ICT utilization is relatively low (Ranasinghe, 2004; Satharasinghe, 2004; Gunawardana, 2005; Gamage & Halpin, 2007; Palagolla & Wickramarachchi, 2009). As researchers emphasized, in comparison with the rest of the world, Sri Lanka is still not a heavy user of ICTs. Overall, the growth of ICTs in Sri Lanka has been slow and uneven and is concentrated mainly in urban areas. However, there exists a wide expansion of ICT concentration in all aspects of the country in recent times contributing to Sri Lanka’s march towards an information economy and a knowledge society. It is clear that ICTs are becoming more and more important in all aspects of the country.

#### **1.2.1.2 ICTs and education in Sri Lanka**

Education system of Sri Lanka is primarily a national system. Sri Lankan national education is free at all levels from kindergarten to first degree at the university level and free textbooks are also provided to all students. The school system of Sri Lanka consists of public/state schools, Pirivenas (the educational institutes where Buddhist monks receive their education) and private/international schools. The medium of instruction in state/public schools is Sinhala or Tamil and it is English in the International schools. English has also been introduced as the language of instruction at secondary level in some state schools recently. English is the second language in the country, and all students should learn English from Grade three to G.C.E (Advanced Level).

The integration of ICTs in secondary education was initiated in Sri Lanka in 1980s by the Sri Lankan government. Proactive government support and funds from international donor agencies enabled Sri Lanka to successfully implement the vision. As a start, computers were provided to some schools in 1984 to familiarize and encourage school children in the use of ICTs. Later on

Computer Resource Centers (CRCs) were established in 1994 in some schools with the support of Asian Development Bank (ADB) to provide basic computer literacy to students during their vacations once they had taken the GCE Ordinary-Level and Advanced-Level examinations, and after they had left schools.

The Ministry of Education (MoE) of Sri Lanka has endeavored to fully utilize ICTs in secondary education since Sri Lanka is still lagging behind in integrating ICTs when compared to other middle income countries. Although it introduced ICT as a subject at the GCE (O.L) in 2001 under a national policy approved in 2001 (Ministry of Education, 2007), ICT education in Sri Lanka does not still seem sustainable as compared to other Asian countries (Edirisuriya, 2006). Further developments in this scenario were taken with support from the World Bank and ADB. Four hundred ICT Centers in schools were established in 2001-2004.

In the year 2006 SchoolNet service was established under the ADB funded project of Secondary School Modernization with the aim of providing Web portal Internet access to 1000 schools, 120 educational institutions (Palagolla & Wickramarachchi, 2009; Pasqual, 2009). Then 1006 Computer Learning Centers (CLCs) were established by 2006 and at present action is being further taken to expand these to enhance teaching and learning through ICTs in secondary schools in Sri Lanka.

However, successful integration of ICTs in Sri Lankan secondary schools has been challenged and its use seems minimal due to inadequacy of teacher training programs, poor English language proficiency among school teachers, lack of connectivity especially in remote, rural, and disadvantaged areas, lack of teacher guides, resource books, and model question papers to support the curriculum and finally a lack of awareness due to poor attitudes (Palagolla & Wickramarachchi, 2009). But the Sri Lanka Country Plan for ICT education attempted to address this issue in a soluble way so as to establish ICT infrastructure for all Sri Lankan schools, to empower teachers with necessary skills of ICT, to supplement educational digital content for all the subjects of Primary/Secondary curricula (“Country plan for ICT education in Sri Lanka,” 2007). Further, 1000 schools have recently been identified for infrastructure development.

Sri Lankan education system has been designed for students to enter conventional universities after successful completion of secondary education. There are 15 conventional universities in the country. The first university, the University of Ceylon was established in 1942 and it was sited in two locations (Peradeniya and Colombo) until the University of Colombo became an independent university in 1968 and the latest one is the Uva Wellassa University (2005). Entry to



Sri Lankan national universities is highly competitive, except in the case of the Open University. A small percentage of the relevant age group gets this chance as compared with the percentages in other countries with respect to the total population in the country. Almost all the courses in the fields of Science, Engineering and Medicine are conducted in the English medium in conventional universities, and the courses in other Faculties are generally are conducted in all three languages Sinhala, English and Tamil. Undergraduate students should qualify in the English language and they are required to get through English language examinations at specified levels to obtain degrees. The English Language Teaching Units (ELTUs) have been set up at all universities to conduct English language programs for academic purposes.

However, Sri Lankan education processes are becoming increasingly technology-intensive and it poses a future challenge for education (Aturupane, 2008). Having identified the importance of ICTs in this scenario, the Government of Sri Lanka under the National Policy on IT has taken several initiatives to enhance access to ICTs in the university education system. These intended to provide IT awareness to all undergraduates, establishing Wide Area Networks (WAN) in all conventional universities, providing the Internet access to all, and introducing ICT courses. These are being implemented in all universities of the country, at various levels. The Lanka Education and Research Network (LEARN) is the National Research and Education Network (NREN) of Sri Lanka, which interconnects Educational and Research institutions across the country. All the higher educational institutions including universities have now been linked to LEARN.

Further, the Sri Lankan government is also allocating extra funds yearly during the last decade to enhance the ICT infrastructure of universities (University Grant Commission (UGC) statistics, 2010) and gradually has increased the bandwidth of the LEARN appropriately. The government has also formed solid plans to enhance ICTs in higher education so as to provide on-line access for all the university courses and distance education for all interested (Aturupane, 2008). The vision of higher education development in “Mahinda Chinthana Vision for the future” includes the establishment of Information Technology Faculties in all universities and the university students are expected to know how to work with a computer and to surf the Internet (Department of National Planning, 2010).

### **1.2.1.3 ICTs and meeting employer demands**

Universities must strive to meet 21<sup>st</sup> century challenges of providing graduates with an education which is driven by ICTs and is viewed by employers as relevant and valuable (Obanya, 2009). This is because an individual who lacks ICT skills has fewer opportunities for personal

advancement, and a society that lacks an ICT literate workforce will not be able to compete in the global economy (Tyler, 2005). The ability to effectively use computers in the workplace is now essential in almost every profession (Kaminiski, Seel, & Cullen, 2003).

Students are supposed to acquire the essential basic skills in order to work with computers and the Internet because most jobs in the 21<sup>st</sup> century will require some use of computers together with communication networks (Fary, 1984). The development and use of communications tools require new communications skills, which do not emerge automatically (Vihera & Nurmela, 2001). It means that there has been a substantial emphasis given regarding the preparation of the global workforce in terms of ICTs.

In this regard the higher education institutions are under increasing pressure to incorporate ICTs into their teaching and learning activities and to prepare technology literate graduates (Kaminiski et al., 2003). However, the rate of integration and the effectiveness of technology use in education are still considerably lower (van Braak, 2004).

In the Sri Lankan situation, higher education institutions now rely mainly on computers and the Internet for all aspects of their activities: administration, teaching, learning and research. Also, conventional universities have made a high institutional investment in ICT infrastructure. Moreover, higher educational institutions increasingly rely on ICTs to develop their students' skills because in all sectors of education, an immense growth on university students' use of computers and the Internet has occurred. The University students Competency Test for IT (UCTIT) exams under the Higher Education for Twenty first Century (HETC) project are also being conducted for university students in all 15 universities to provide an opportunity to enhance their IT skills and get recognition for their IT knowledge. Employers, moreover, expect graduates to be "ICT fluent" and to keep this trend continuously to have more jobs (Gunawardana, 2005; Wickramasinghe & Perera, 2010). Therefore, there is a strong emphasis in universities to constantly develop and evaluate their ICT provision in order to remain attractive to both graduates and employers. A varied set of stakeholders, not limited to the Government, is making attempts to ensure the relevance of education in terms of employer requirements, and more importantly today, the ability of students and graduates to compete globally taking ICTs as a key competence for success.

In Sri Lankan job market analysis, many employers are not satisfied with the competencies and skills of graduates (Weligamage & Siengthai, 2003). They complain that the graduates do not have the knowledge and skills required for job performance and demand more training to make

them better suited. Therefore, there is less demand for graduates in Sri Lanka because employers seek quality graduates who can effectively face the challenges in the rapidly changing ICT environment. This is basically due to the existing mismatch between the graduates' ICT competencies and the employers' demand (Aggestam & Hallberg, 2004; Herath & Ranasinghe, 2011).

Many researchers have explored this issue. Researchers argue that in 1997 the government implemented the *Tharuna Aruna Scheme* to assist unemployed university graduates in finding employment in the private sector (World Bank, 1999). The conclusions drawn from that scheme confirms that employers prefer Science and Commerce graduates who are well equipped with analytical and computer skills. The problem is that Sri Lankan students have very limited exposure to English and the development of technical skills has been neglected at even higher levels of education. On the other hand, nearly 80% of the applicants who were graduates in Humanities and Arts did not possess the skills needed (World Bank, 1999).

Central Bank, (2009) report highlighted that general skills are critically important for the labor market of a middle income country, but are especially scarce in Sri Lanka. Highest among these scarce general skills are English Language and ICT skills. The report further accentuated that a graduate who lacks fluency in an international language and ICT skills is cut-off from much of the world of the twenty-first century knowledge and information and that his or her productivity and performance at work would fall well below the level required by reputed private sector firms from their managerial staff and technical specialists.

University education in Sri Lanka suffers from both the inability to meet demand and the failure to supply a quality education compatible with labor market requirements (Central Bank, 2010). The education system has been producing graduates without any exposure to computers (Wikramanayake, Hewagamage, Gamage, & Weerasinghe, 2007). When these graduates join the global job market, they are not equipped to use technology and they fail to compete with global ICT skill levels. Herath & Ranasinghe (2011) also have found that private sector employers complain that Sri Lankan Business graduates especially lack ICT skills. More recently, it has been shown that the expected outcome of the ICT facilitated education in universities which focuses on improving Digital Literacy has not been achieved yet (Godamanna & Jayamaha, 2013). This was further confirmed by Hewagamage (2013) with the results of the IT proficiency test conducted under HETC project for undergraduates in Sri Lanka, finding that only a 49.7% of undergraduates have obtained the pass mark (50).

These circumstances create an uncertain dilemma as to why undergraduates are not using ICTs up to the desired level even under a regular improvement of ICT perspectives in universities. A number of factors have been identified and recommendations have been made to substantially strengthen producing international quality graduates in terms of IT literacy and competence as a necessary condition for a good quality graduate in the modern world. Finally, it was found that the ultimate necessity is that an individual graduate should improve himself/herself in the ICT use and the future acceptance in order to create a good demand at the job market for them (Garrido, Sullivan, Gordon, & Coward, 2009). Therefore, it is relevant to explore this environment in the individual context of undergraduates in Sri Lankan universities.

### **1.2.2 Theoretical background**

Understanding why people accept or reject ICTs use has been one of the most challenging issues (Oye, Iahad, & Rahim, 2012). Technology acceptance is about how people agree to and adopt some technology to use (Louho, Kallioja, & Oittinen, 2006) and it is a process starting with the user becoming aware of the technology, and ending with the user embracing the technology and making full use of it (Renaud & van Biljon, 2008). Dillon & Morris (2006) defined user acceptance as the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support and this concept is not being applied to situations in which users claim they will employ it without providing evidence of use, or to the use of a technology for purposes unintended by the designers such as using the Internet connection for personal entertainment in a work situation.

Information Systems researchers focused for a long time on how and why individuals adopt technology. These researchers have focused across individual use and acceptance (Davis, Bagozzi & Warshaw, 1989; Compeau & Higgins, 1995), implementation success at organization level (Leonard-Barton & Deschamps, 1988) and task-technology fit (Goodhue, 1995; Goodhue & Thompson, 1995). Individual use and acceptance of technology is a vastly researched area among these studies and measuring variables are continuously developing over time.

The first theoretical perspective to gain widespread use and acceptance in this research area was the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). This theory maintains that individuals would use technology if they could see that there would be positive benefits (outcomes) associated with using them. Another fundamental outcome measure of individuals' use and acceptance is their attitude towards using the technology. The attitude towards using technology refers to "an individual's overall affective reaction to using a system" (Venkatesh et al., 2003, p. 455). Consideration of user attitude is an integral part of educational ICT use as

attitudes influence not only individuals' initial use of ICTs, but their future acceptance behavior regarding technology (Selwyn, 1997). Ajzen & Fishbein (1977) recommend that an attitude measure should be specific in terms of the target and the context of behavior being assessed.

However, the necessity of other explanatory variables has been identified (Thompson, Higgins, & Howell, 1991; Webster & Martocchio, 1992) to best explain technology use and acceptance behaviour. Such variables were introduced by Albert Bandura in his work on Social Cognitive Theory (SCT) (Bandura, 1986). SCT is based on the premise that environmental influences such as social pressures or unique situational characteristics, cognitive and other personal factors including personality as well as demographic characteristics are equally significant in determining behaviour. One such variable derived to understand the factors that influence an individual's use of information technology is self-efficacy which is the belief that one has the capability to perform a particular behavior (Compeau & Higgins, 1995). It is concerned not with the skills one has, but with judgments of what one can do with whatever skills one possesses (Bandura, 1986, p. 391). Compeau & Higgins (1995) have added self-efficacy to understand why people use technology, over and above concepts like outcome expectations, anxiety, and affect. Further, more variables, such as gender, age, and experience, from SCT were researched as to whether they play an important role in the explanation of the acceptance of ICTs (Sutton, 1991; Gefen & Straub, 1997; Reinen & Plomp, 1997; Venkatesh & Davis, 2000; Volman & Eck, 2001; Colley & Comber, 2003; Losh, 2004).

The basic concept of individual's ICT use and acceptance could be further reflected on various aspects within contexts such as user, technology and organization. Researchers have revealed that positive benefits (outcomes) associated with using technology (Fishbein & Ajzen, 1975) are more timely. This view was later termed as the 'perceived usefulness' which refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Venkatesh et al., 2003, p. 448). Some focus on the explanation of use and acceptance of ICTs and find its inspiration in the perceived usefulness of a technology and the relative comfort of learning it (Verhoeven, Heerwegh, & De Wit, 2010). Relative comfort is the perceived ease of use which refers to "the degree to which a person believes that using a particular system would be free of effort" (Venkatesh et al., 2003, p. 450). Davis et al. (1989) found a strong relationship between the usefulness of a system and the usage of a system, and this relationship was much stronger than the relationship between the ease of use of a system and its use. This approach was later called the Technology Acceptance Model (TAM) developed from the Theory of Reasoned Action (TRA). The model assumes that both perceived usefulness

and perceived ease of use of the new technology are central in influencing the individual's attitude towards using that technology (van Raaij & Schepers, 2008; Park & Park, 2009; Teo et al., 2009; Pouratashi & Rezvanfar, 2010; Sanchez-Franco, 2010). Research has shown that those two explanatory variables are very important for the explanation of the intention to use ICTs and ICT competence (Teo et al., 2009).

Two other variables were added to the design of the Unified Theory of Acceptance and Use of Technology (UTAUT) by (Venkatesh et al., 2003); they are social influence and facilitating conditions. Social influence has been defined as “the degree to which an individual perceives that significant others believe that he or she should choose the new system” (Venkatesh et al., 2003, p. 451). Facilitating conditions may be described as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (Venkatesh et al., 2003, p. 453). Attitude, self-efficacy and anxiety which together is “the degree to which a person is afraid to use or apply new information technology” have also been considered by (Venkatesh et al., 2003) to have a significant effect on technology acceptance.

Perceived usefulness, perceived ease of use, social influence, facilitating conditions, attitude, self-efficacy and anxiety together would thus be the basis of the explanation of the usage of technology (Wu, Tao, & Yang, 2007; van Raaij & Schepers, 2008; Wills, El-Gayar, & Bennett, 2008). Although these variables play a very important role in the explanation of the use and acceptance of technology, Venkatesh et al. (2003) have also added situational variables, gender, age, experience and voluntariness of use to the UTAUT model and they play key roles in the explanation of the use and acceptance of ICTs (Verhoeven et al., 2010; De Wit, Heerwegh, & Verhoeven, 2011; Verhoeven, Heerwegh, & Wit, 2011). Therefore, the UTAUT model has covered a vast area in technology acceptance research. UTAUT has been tested and has received acceptance among technology acceptance researchers. The acceptance of this model rests on its high explanatory power. During its development, the UTAUT model test results revealed that it was capable of accounting for 70% of variance in intention to use several different technologies; thus making it a robust and comprehensive model, while other models could explain less than 50% of variance (Venkatesh et al., 2003; Rosen, 2005). It should be noted that although the UTAUT model is very promising in enhancing our understanding of technology acceptance, it may still need modifications to suit specific contextual research settings (Wu et al., 2007). It is claimed for example, by Gogus, Nistor, Riley, & Lerche, 2012 that the UTAUT, was insufficiently validated in culturally diverse settings.

Culture specific variables can have an impact on an individual's decision to use and the acceptance of a specific technology (Myers & Tan, 2002). At the individual level of analysis, culture can be treated as an individual difference variable (Srite & Karahanna, 2006) and this concept is the most influential culture theory among social-science research too, with strong empirical support (Sanchez-Franco, Martínez-López, & Martín-Velicia, 2009).

Though, many approaches and frameworks have been used to measure culture, from an academic perspective, the effects of culture on ICT use and acceptance have been studied by research based principally on Hofstede's (1980) cultural dimensions. Hofstede's cultural dimensions have also been widely used in studies in which culture is an important facet of the research context especially within the information systems discipline (Straub, Loch, Evaristo, Karahanna, & Srite, 2002; Ali, Brooks, Alshawi & Papazafeiropoulou, 2006; Cardon & Marshall, 2008; Voros & Choudrie, 2011). Hofstede (1997) stated that culture shaped individual values and affected individual behavior and that it was seen to be different across social environments such as nation, ethnicity or profession and that people may behave differently depending on their culture. Hofstede's four cultural dimensions; power distance, individualism/ collectivism, masculinity/ femininity and uncertainty avoidance are used to explore the technology acceptance behavior of individual university students in different cultural settings.

In conclusion, an understanding of all these concerns with UTAUT will provide a solid base to explain how individuals use, accept or reject a technology in a specific perspective. But, there is no single, unified, universally accepted theory of adoption and diffusion and each theoretical model addresses different aspects of the diffusion process or a different type of innovation or organization (Surry, Ensminger, & Haab, 2005). Therefore, researching these concepts enabled the researcher to determine which would be the most appropriate means of predicting ICT use and acceptance behavior of university students in Sri Lanka in order to promote the usage.

### **1.2.3 Empirical background**

In conceptualizing ICT use and acceptance behavior of university students in Sri Lanka, suitability of technology acceptance theories were examined to identify the best suited diagnostic model to promote usage and also to explain what hinders acceptance and usage of technologies in Sri Lanka.

Literature clearly demonstrates the mushrooming growth of studies on technology acceptance and use used in various organizational, technological and individual user contexts and that UTAUT was proposed and validated in order to afford a unified theoretical basis to facilitate

research on technology adoption and diffusion. After a comprehensive review of literature on the university context a favorable number of facts could be drawn;

- Studies have covered a vast range of technology applications from the basic computer using, web 2.0 technologies to the newest concept, cloud computing.
- Technology acceptance applications have taken place in many countries all over the world such as USA, UK, China, Saudi Arabia and India etc. with different behaviors. However, these theories and models were developed in the West and focused on large organizations and developed countries have sufficient resources and greater training facilities unlike developing countries.
- Although, additional determinants were adapted specifically to suit particular technologies and particular user categories in those applications, it was found that when tested outside of North America; Switzerland, Japan and Arabic countries etc. most models have been found to be less productive (Straub, 1994; Straub, Keil, & Brenner, 1997; Rose & Straub, 1998; Anandarajan, Igarria, & Anakwe, 2000; Bagozzi, Wong, Abe, & Bergami, 2000; Al-Gahtani, 2001; Loch, Straub, & Kamel, 2003; Mao & Palvia, 2006; McCoy, Galletta, & King, 2007; Schepers & Wetzels, 2007).
- Some variables were adapted for the UTAUT to examine a particular effect even though they have not been strictly highlighted in UTAUT.
- Many authors have found that the culture has a strong contextual influence on how individuals employ ICTs (Davies, 1988; Makrakis, 1992; Layton, 1994; Holmes, 1998; Collis, 1999; Li & Kirkup, 2007).
- Research has been done in different countries and results are attributed to country-level differences on the dimensions of culture but not to individual cultural values. Even though, the culture plays an important role in technology acceptance, prior research typically tested these individual-level models in aggregate indifferent countries and differences in observed results are attributed to country-level differences on the dimensions of culture (Srite & Karahanna, 2006).
- Also, it has further been claimed by some authors that the UTAUT is insufficiently validated in culturally diverse settings (Wu et al., 2007; Nistor et al., 2012).

Therefore an unanswered concern that remains is that although the UTAUT model is very promising in enhancing our understanding of technology acceptance, it still needs modifications to suit specific contextual research settings. As highlighted above, inconsistencies may have among them key determinants and moderators for specific contexts, other than the determinants and moderators developed in the original model for the original context. Some other



determinants and moderators can also play important roles with respect to ICT use and acceptance in the Sri Lankan university context outside where they were constructed.

In the Sri Lankan context, the mother tongue of the majority of the population is Sinhala and the main religion is Buddhism. However, there are other cultural groups and religious groups as well. Hence, there is a need for include the cultural dimensions' effect on the individual use and acceptance of ICT behavior of Sri Lankan university students. Existing theoretical frameworks do not reflect the unique individual cultural situation of Sri Lanka and adaptation may require an improved exploration. Also, as new technologies keep evolving all the time in the world of technology, studies cannot be constant across time and/or in different contexts. Therefore, a parsimonious and a robust model which best describes the use and acceptance of ICTs of university students in the Sri Lankan context is very critical in order to promote the usage of ICTs to be enable the individual graduates to make a demand in the job market and achieve the vision to e-Sri Lanka.

#### **1.2.4 Statement of the problem**

There has been an enormous effort regarding the preparation of the global workforce in terms of ICTs (Dougherty et al., 2002) and the factors that emerged have strengthened and encouraged moves to adopt ICTs in higher education all over the world. While a lot of researchers in the field of Information Systems have focused on a variety of technological contexts, very few empirical research studies have been carried out in the field of Information Sciences (Suraweera & Liew, 2011) even when the researchers in the field have the accountability of making future workforce information literate where ICTs perform as the driving force. Therefore, an unanswered concern which remains is "Could the existing models be used without modifications in improved exploration of ICT use and acceptance in various contexts?" There may be inconsistencies among key determinants and moderators of existing models contextually. It is questioned whether only the determinants and moderators developed in the original model to the original context have been constructed. Perhaps some other determinants and moderators also play important roles with respect to technology acceptance and use in contexts outside where they were constructed. This means that modifications are still needed to suit contextually specific cultural settings. These should be thoroughly investigated to improve the ICT use of universities.

It is expected to provide ICT infrastructure in a similar manner across all the universities in Sri Lanka. But the ICT acceptance and likelihood of use is variable (Hewagamage, 2009). That may not be due to institutional factors, but may be due to individual factors. The different indicators of ICT use and acceptance in the university may not be properly understood. The use of

institutional and individual perceptions of acceptance and the analysis of use differences among various technological domains are essential to determine the most effective means of explaining ICT use and acceptance by Sri Lankan university students.

### **1.2.5 Purpose of the study**

This study aims to develop a model for assessing the extent to which individual characteristics can describe current ICT usage behavior and future acceptance of the university students in the Sri Lankan context. In order to address the purpose of the study, the objectives are outlined as indicated below.

#### **1.2.5.1 Objectives of the study**

1. To assess what types of ICTs are in use by university students in Sri Lanka.
2. To assess the extent to which Sri Lankan university students use and intend to use ICTs.
3. To identify the effect of socio-demographic factors on ICT use and acceptance of university students.
4. To investigate how university students are motivated to improve the use of ICTs.
5. To propose a model which best describes the ICT use and acceptance of university students in Sri Lanka

#### **1.2.5.2 Research questions**

These objectives comprise three research questions.

- Do differences exist among university students in their levels of ICT use and acceptance and types of ICTs?
- If differences exist, what are the reasons for their different levels of ICT use and acceptance?
- What strategies should be recommended to promote ICT use and acceptance behavior of university students?

Table 1.1 summarizes the objectives, research questions and possible sources of data of the study. This table will guide the data collection and analysis in all stages of the research.

## **1.3 RESEARCH DESIGN AND METHODOLOGY**

The research design and methodology applied in the research are described in this section. The study has been designed under two main phases- an exploratory study which constitutes checking the feasibility of conducting the proposed study in the context of a sample of university students which covers the investigation of the present situation regarding ICTs in universities

and the job market, identifying the determinants of ICT use and essential ICT tools which a fresh graduate basically has to be able to use. The main survey aims at testing the proposed model.

The basic philosophy underlying this study is positivism. Since semi-structured interviews and focus group discussions are employed in the first phase of the study it follows the phenomenological approach. The first phase of the study uses a mix of quantitative and qualitative paradigms since it aims to explore the entire ICT use and acceptance behavior of university students through semi structured interviews in order to focus on the problem addressed in the study. The inductive approach characteristics is deployed to recognize the underpinning theories, preliminary information, determinants and ICT tools through semi structured interviews and focus group discussions. However, the second phase of research is entirely based on the deductive approach, as it adopts a positivist inquiry to achieve predictive values and it purely quantitative in nature.

The research is mainly exploratory in nature. The explanatory survey strategy is used in this study to identify the relationships between factors and the ICT use behavior in the Sri Lankan university sector. The current study examines the ICT use behavior of university students at a given point in time and therefore it is a cross sectional study of 1<sup>st</sup> year and 3<sup>rd</sup> year university students.

The exploratory study was conducted for a specific group of participants. Non-probability sampling is employed with a specific purpose in mind and 24 interviews/group discussions were conducted. Eighteen subjects were from the university sector and six were from other fields. The sample from the University community consisted of lecturers who handle ICT activities in Faculties, Librarian, computer officers and undergraduates the four universities selected for the study. Participants from the other fields comprise human resource personnel who are top level persons in charge of recruitment for jobs in Sri Lankan leading fields such as diversified companies, higher education, industrial, administrative and finance. Four (4) discussions were scheduled with students in the selected four universities, that is, one discussion per university. Each group comprised students from Arts, Science and Management Faculties. Content analysis and descriptive statistics using SPSS were performed for data analysis of the exploratory study.

The main survey was conducted using a stratified random sample of 2,331 first year and third year undergraduate students from the selected four universities. Data gathering for the study was done using a structured questionnaire with the specific sample by the researcher personally visiting the selected universities. Basically the Structural Equation Modeling (SEM) was used

along with other parametric and non-parametric statistical techniques to achieve the objectives in this phase.

#### 1.4 SCOPE OF THE STUDY

The aim of this section is to demarcate the boundaries of the study and to set the parameters of the research undertaken. Use and acceptance of ICTs in higher education has come into prominence, attracting the attention of academics in universities as well as individual students themselves. The conceptual framework of the study, with its demarcated boundaries, was adopted and the researcher was able to deliberately establish two delimitations for this study, which are briefly explained below.

There are many theories and models with a large number of variables and dimensions for the ICT use and acceptance. However, variables that are appropriate and relevant to the study could be obtained from literature and observed practices. Although there are some other prominent theories existing in the literature, the use of the UTAUT model has been widely accepted and applied in technology acceptance literature in different cultural contexts.

**Table 1.1**

<b>Research propositions</b>		
<b>Objectives</b>	<b>Research questions</b>	<b>Possible sources of data</b>
To assess what types of ICTs are used by university students in Sri Lanka.  To assess the extent to which Sri Lankan university students use and intend to use ICTs.	Do differences exist among students in their levels of ICT use and acceptance and types of ICTs?	1.Semi structured interviews/ Focus group discussions 2.Structured questionnaire
To explore the socio-demographic and cultural factors that may influence ICT use and acceptance of university students.  To investigate how university students are motivated to improve the use and acceptance of ICTs.	If differences exist, what are the reasons behind their different levels of ICT use and acceptance?	1.Semi structured interviews/ Focus group discussions 2.Structured questionnaire
To formulate a model which best describes the ICT use and acceptance of university students in Sri Lanka.	What strategies should be recommended to promote ICT use and acceptance and use behavior of university students?	1.Structured questionnaire

Source: Compilation by the author

This study focuses on two universities located in Colombo, the capital of Sri Lanka- the University of Colombo and the University of Sri Jayewardenepura, and other two universities located in the outer regions- the University of Ruhuna in the Southern Province, and the South-Eastern University of Sri Lanka, located in the Eastern Province, in order to include a wider representative sample from the entire university system in Sri Lanka. To grasp the disciplinary differences in ICT use and acceptance within very common subject streams, Science, Management and Arts except Medicine, Engineering and IT, only the relevant Faculties from each of the selected universities were selected as samples. Since it was expected to investigate how university students are motivated to improve the use of ICTs from an individual perspective, a cross sectional study of first year and third year students, was considered as the sampling population for the study, because the use behavior and the attitudes on ICTs could have changed by the third year with the institutional ICT environment.

### **1.5 ORIGINALITY AND THE CONTRIBUTION OF THE RESEARCH**

As indicated by literature, during the past decade, Information Science research has drastically matured and moved towards conceptually and contextually better. This has facilitated to research to be undertaken to achieve wider conceptual progress. However, the researcher was motivated to conduct the current study due to the need to validate the concepts of ICT use and acceptance across different cultures and this research aims for a greater degree of reliability and validity through a robust and comprehensive framework and a systematic methodological process of the research. The application of Structural Equation Modeling (SEM) promotes a better quality of the research associated with ICT use and acceptance in a cultural context and it has useful features, especially in modeling multivariate relations, and there are no widely and easily applied alternative methods of this kind (Byrne, 2006). Therefore, this research, it is hoped, will significantly contribute to the Information Science discipline to provide a broader theoretical growth.

A higher number of past researches related to the current study have been carried out in Western countries and a few in Eastern Asian countries. Therefore, it was considered important and significant to investigate the Sri Lankan scenario to enhance the existing body of knowledge for worldwide application as another original contribution to the body of knowledge since the Sri Lankan national universities facilitating a free education from the undergraduate level and functioning in multi-cultural surroundings, provide a new dimension and insights into the ICT environment.

Moreover, Walker (1997) has provided some features to be considered in relation to the originality of a research. These were new areas of research, new interpretations of existing material, new applications of existing theories to new areas, or new blends of ideas and development of new methodologies, tools and/or techniques. The current research has contributed to develop appropriate measures using well suited theories/ models to predict the ICT use and acceptance behavior of the university students in the context of Sri Lanka.

The necessity to develop a new model for the individual use and future acceptance of ICTs by Sri Lankan university students were based on two major reasons. One reason was that the literature reveals that the existing models should be revised for specific user, organizational and technology and cultural contexts (Venkatesh et al., 2003; Kriponant, 2007; Rucker, 2010). The second reason was that the literature disclosed that none of the studies had been carried out to comprehensively explore the ICT use and future acceptance behavior under a strong theoretical basis accompanying with the individual cultural aspects in the context of Sri Lankan universities. Therefore, the current study provides a better parsimonious model for the prediction of ICT use and acceptance behavior based on two theoretical paradigms: technology acceptance and individual cultural aspects which demonstrate another aspect of novelty for the knowledge base.

## **1.6 SIGNIFICANCE OF THE RESEARCH**

This study would serve as a useful tool to explain ICT use and acceptance behavior of university students in Sri Lanka and also to suggest strategies to improve the use and acceptance of ICTs to gain skills and thereby contribute to accrue higher dividends for the individuals as well as the society as a whole.

A measure of success today is how well one can communicate, evaluate, and manage all forms of information within a technological environment. These are ICT skills. ICT skills are increasingly taken for granted at all stages of a student's educational experience from kindergarten to university and the skills gained depend on the level of acceptance and their use. Students who lack ICT skills cannot fully benefit from learning opportunities. Students who are less proficient in ICTs may be unable to evaluate the validity of information that they find through modern search engines or draw meaning from such information. They may not be able to compare information from numerous sources or communicate their findings effectively, ethically and legally. An individual who lacks ICT skills has fewer opportunities for personal advancement, and finally a society that lacks an ICT literate workforce will not be able to compete in the global economy (Ellis, 2001). The lost opportunity to acquire these skills in the university may follow them throughout their careers. Therefore, the universities have made

considerable efforts to get students to use Information Technology and the study will be extremely useful.

Despite widespread consensus about the need for ICT literacy among university students, there is little information available to explore the dimensions of the need or what might be done to address it. As such, there is still a need to measure the effectiveness of these efforts and to evaluate whether students have obtained the ICT skills that they need to be successful in an information-rich, technology-based society. Further, there are numerous barriers to the integration of instructional technology into higher education, such as technology infrastructure, faculty effort, technology satisfaction, student characteristics and undergraduates' competency (Surry et al., 2005). Hence, the researchers need to identify the root causes for low ICT performance and more action would be required to enhance both the knowledge and skills of ICT proficiency in order to make undergraduates more employable and productive knowledge workers in the future. Therefore, the outcomes of the study are very vital for the total university system to enhance the quality of its products. Moreover this would be very important for improving the employability of individual students.

Universities can use the aggregated results in a variety of ways:

- Consider information on the ICT behaviors, preferences and attitudes of undergraduates, especially as it relates to their academic experience.
- Provide information to university administrators that will help them to develop a conducive university ICT environment for students.
- Inform teaching faculty and librarians to develop their curricula, resources and services in rich and meaningful ways.
- Improve ICT proficiency and determine students' need for training in individual level
  - Help guide curricular innovations and changes
  - Provide support for institutional ICT literacy initiatives

For the individual students the benefits can come in different ways:

- Satisfaction of the need for an Information Technology literacy requirement
- Enhance employability

As argued, the critical issues of how to make full use of ICTs in facilitating higher education processes are of national concern. National plans have been issued to motivate and support ICT use in the country towards the march of e-Sri Lanka concept. Therefore it is essential for all students in higher education to use ICTs, in order to cope with global students who have already

had an ICT experience. The model produced from this research could afford information necessary in explaining what promotes ICT use and what hinders use. It is expected that this research will help develop National Policies especially to develop a policy to increase ICT use in higher education process.

### 1.7 DEFINITION OF TERMS

The operational definitions used in this study as a basis for understanding the conceptual and contextual concepts related to the stated research problem are given below.

**ICTs** are the computer and Internet application tools and resources used to communicate, and to create, disseminate, store, and manage information which is accessed via desktop computers, laptop computers, Internet enabled smart phones and other handheld devices.

**Internet** is a publicly available computer network consisting of a worldwide network of computer networks that use the TCP/IP network protocols to facilitate data transmission and exchange.

**Culture** is the complete way of life of a people: the shared attitudes, values, goals, and practices that characterize a group; their customs, art, literature, religion, philosophy, etc.; the pattern of learned and shared behavior among the members of a group.

### 1.8 STRUCTURE OF THE THESIS

**Chapter 1 – Introduction** – The background of the study and a brief overview of the theoretical and contextual backgrounds to the research study are discussed in this chapter. The research objectives, research questions, potential contribution, scope and outline of the thesis are briefly discussed.

**Chapter 2 – Review of theoretical and empirical literature** – This chapter reviews the theoretical and empirical literature in relation to technology acceptance, which cover supporting relationships to address the study.

**Chapter 3 –Theoretical framework and hypotheses**– This chapter formulate the theoretical framework of the study based on the theoretical and empirical literature reviewed on technology acceptance.

**Chapter 4 – Research design and methodology** – This chapter comprises two major parts- the study framework, and research strategy and methods. The framework of the study gives direction to the empirical aspect of the study and the research strategy and methods present the



underpinning research methodology of the study. The sampling procedure, data collection procedure and analytical procedure used are also presented.

**Chapter 5 – Exploratory study: Data analysis and findings** – This chapter presents the results of the data analysis in the first stage of the research design—that is, the exploratory study.

**Chapter 6 – Main study: Preliminary data analysis and findings** – This chapter presents the preliminary data analysis of the second phase of the study (main study).

**Chapter 7 – ICT use and acceptance modeling** – This chapter covers the proposed research model testing and the final formulation of the best model applicable to the Sri Lankan context.

**Chapter 8 – Conclusions and suggestions**– This chapter presents a summary of the thesis, the model developed and discusses the findings of the study in general. The chapter concludes with suggestions for future research.

## CHAPTER 2

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### REVIEW OF THEORETICAL AND EMPIRICAL LITERATURE

#### 2.1 INTRODUCTION

This chapter presents the review of the theoretical and empirical literature, which provides a conceptual underpinning for the study that focuses on the ICT use and acceptance behavior of university students. It attempts to discuss the main theories underlying technology use and acceptance in order to construct an integrated conceptualization of theories or models, which will form the conceptual base of this study. The concepts and constructs of existing theories/models on technology acceptance, and individual cultural dimensions on technology use and acceptance are comprehensively reviewed with empirical applications. The review thus facilitated the foundation on development of a theoretical framework to gain a clear understanding of ICT use and its acceptance by university students in Sri Lanka.

#### 2.2 USE AND ACCEPTANCE OF ICTS IN UNIVERSITIES

ICTs provide the latest means which makes it possible to communicate, inquire, make decisions and solve problems and improve the quality of education by augmenting student enthusiasm and commitment and the acquisition of fundamental skills of students (Sarkar, 2012). Therefore, ICT use and acceptance for education is more critical today than before (Pajo & Wallace, 2001) and it has increasingly adopted various kinds of tools for teaching, curriculum development, staff development, and student learning (Kumpulainen, 2007; Usluel et al., 2008). Vast arrays of ICT tools which are kept apart in many technological aspects have touched virtually all dimensions of universities.

Some researchers (Zoraini, Lim, & Tai-Kwan, 2009; Lei, 2010; Young, 2011) view technology such as a smart phone and laptop as influential technology that may directly affect teaching and learning outcomes and that further use of these technologies, can encourage the shift to an environment which is learner-centered. In such a learning environment, with the aid of the relevant technology, students are able to collaborate, use critical thinking, develop /higher order thinking, develop certain generic skills like lifelong learning skills and find alternatives for solution of problems (Dewey, 1943; Yuen, Law, & Wong, 2003; Ebner, Lienhardt, Rohs, & Meyer, 2010; Žerovnik, Rugelj, & Šerbec, 2011; Biasutti & EL-Deghaidy, 2012). The success of the newer Web 2.0 movement (O'Reilly, 2005) and the proliferation of Web-based applications have encouraged the appearance of ICT tools and their acceptance to support making educated

individuals (Conole & Alevizou, 2010). Therefore, the importance of ubiquitous technology in the higher educational system and integration is magnified (Sedek, Mahmud, Jalil, & Daud, 2012).

Surry & Ensminger (2006) pointed out that there are many different investigations and topics on subjects related to technology and also that these are at various levels within any educational system, with different expectations and drivers about technology's value and adoption at both personal and organizational levels. Most researchers suggest that university students do use technologies for learning but that great diversity exists in frequency of technology use, types of technologies adopted, and their readiness to integrate technology into learning (Kennedy, Judd, Churchward, Gray, & Krause, 2008; Johnson, Levine, & Smith, 2009; Jones, Ramanau, Cross, & Healing, 2010; Lai & Gu, 2011).

The impact of ICTs on study and learning practices has generated research seeking to identify both the extent of ICT usage and the effects it is having on student experience at university more broadly (Conole, De Laat, Dillon, & Darby, 2008). Empirical studies, conducted in different countries and in different types of universities, are reaching very similar conclusions suggesting that the 'digital native' label may be too simplistic to explain the ways young people use technologies (Margaryan, Littlejohn, & Vojt, 2011). Hence the results of some surveys suggest that to accept the claims of some of the researchers on the changes needed in universities to cater for technology savvy students, further research would be needed (Kennedy et al., 2007; Combes, 2009; Lei, 2010; Jones & Shao, 2011; Margaryan et al., 2011).

### **2.2.1 Different ICT uses in universities**

In the world of higher education, virtually every aspect of scholarship has been influenced by technology. ICT is becoming a necessity even to gain university entry through filling in an on-line application form and it is important to the student to use the Internet to access up-to-date publications or even to word-process their assignments/reports/dissertations. Students conduct research through the Web, drawing from academic journals, newspaper articles and speech transcripts. Some submit assignments online and e-mail completed projects to their lecturers. Many use spreadsheets, graph plotters, presentation programs and multimedia tools on a regular basis. The proliferation of distance education and e-learning has altered the traditional definition of "the classroom."

According to the literature reviewed, most of the universities are basically equipped with computers with ordinary operational and application software such as Windows, MS Office and

the Internet access at numerous levels. Only a minority of the courses do not require students to have computer access in most universities. Some universities provide personal computers and computer lab facilities but some universities allow students to use their own laptops for access to the Internet anywhere in the university premises facilitating wireless networking. University websites would help in information dissemination and e-management. University libraries all over the world also make available a wide variety of electronic information sources such as integrated library software, e-books and e-journals etc. Universities, especially those in the West, have adopted most of novel ICT tools as a means to impart upon students the knowledge and skills demanded by 21<sup>st</sup> century advancement (UNESCO, 2009). Sophisticated software, novel ways for communication and efficient educational ICT tools etc. have become a crucial part of using ICTs in universities. These include Web 2.0 technologies and Virtual Learning Environments (VLE) too.

Web 2.0 technologies have become the novel trend and have opened new doors for more effective learning giving the potential to support lifelong learning (Klamma et al., 2007; Richardson, 2010). Many of these tools such as Facebook, wikis etc. which were not specifically designed for educational purposes, have been successfully employed in the classroom (Richardson, 2010). There are so many different ICT tools available that choosing a suitable one for a specific learning situation is not an easy step, and requires the educator to be informed about the educational capabilities of different ICT tools (Ruiz-Calleja et al., 2012).

Prior researchers have identified that web 2.0 technologies are mostly used for educational purposes (Selwyn, 1997; Ito et al., 2009; Luckin et al., 2009; Christine Greenhow, 2011) since those tools provide for active participation to the process of learning and can be used effectively in the individual and collaborative learning environments (Minocha, 2008; Gruzd, Staves, & Wilk, 2012). Avci & Askar (2012) showed that university students are positive to using blog and wiki in the teaching-learning process and that they found wiki more useful. Amichai-Hamburger & Vinitzky (2010) showed a strong link between individual personality and Facebook use by university students in Israel. It is obvious that the impact of using web 2.0 technologies is diverse.

VLE are used in universities in this era in which web-based communication platforms that allow students, without limitation of time and place, to access different learning tools, such as program information, course content, teacher assistance, discussion boards, document sharing systems, and learning resources (Martins & Kellermanns, 2004). VLE have found enabled improvements in communication efficiency, both between student and teacher, as well as among students

(Martins & Kellermanns, 2004). Also, they are having intense, immediate, and disruptive transformations on education systems (Archer, Anderson, & Garrison, 1999). Zhang et al. (2004) reported improved academic outcomes and Chou & Liu, (2005) showed improved learning performance and satisfaction from students using VLE. Also, students agreed that VLE is a good idea and that its frequent usage is useful at the university (Marchewka, Liu, & Kostiwa, 2007).

Since a large range of ICT tools for different uses are employed by students and different tools are specific for different purposes regarding the ICT use in universities, a thorough examination of literature related to the ICT use and acceptance in the university context and employers' context within various countries was performed. Important ICT tools and their different uses were identified (see *Appendix I*). In the university context, most of the studies have focused only on one specific ICT tool/type or an application. Even though, some researchers have used the term ICT/ technology/IT, they have specified the term ICT in different ways-as different tools or/and different purposes/uses (see *Appendix I*). Since, the current research is conducted with a focus on the readiness of the fresh graduates for the competitive job market demand, studies with the intention of identifying ICT use and acceptance role in organizational productivity, and organizational performance in various sectors were also reviewed and they provide better evidence regarding ICT needs of the job market. However, ICT tools and their different uses for data gathering were formulated as: academic/ educational technology use, social communication use, technical use and other use.

### **2.2.2 Factors affecting ICT use and acceptance in universities**

Level of access, hours spent on computers and the Internet, frequency of use and perceptions on competence and generally the role of ICTs have been taken as the core determinants of most empirical studies. A significant difference has been identified between the ICT availability and the utilization by Umunadi (2011). ICT usage has been measured through the attitude towards computers, self-efficacy and computer phobia by Selwyn (1997), Macleod, Denise, & Haywood (2002), Waldman (2003), Gay et al. (2006), Li & Kirkup (2007), Mcilroy, Sadler & Boojawon (2007) and by Mahmood (2009) on a variety of ICT contexts. Most of the non-theory based studies have identified gender, age, and study year as the differentiating factors on ICT use behavior. Subject wise disparities in ICT acceptance have also been identified by Samaradiwakara (2010) and Mahmood (2009). They have found that the students from Arts and Humanities disciplines were not sufficiently aware of the benefits of ICTs. Prior experience of computer or/and the Internet and the secondary school experience on computing were other differentiating factors identified (MacLeod et al., 2000; Li & Kirkup, 2007; Rekabdarkolaei &

Amuei, 2008; Samaradiwakara, 2010; Luu & Freeman, 2011). A Sri Lankan study, found sector (urban/rural) differences in use and acceptance of ICTs (Samaradiwakara, 2010).

Some researchers have empirically tested the knowledge on ICTs, competences or skills on ICTs through tests and identified the differences between perceived competence and the actual skills (Lee, 2003; Madigan, Goodfellow, & Stone, 2007; Hilberg & Meiselwitz, 2008; Nash, 2009; Hewagamage, 2009). These studies attempted to test whether the students possess the basic level of computer proficiency needed to study in universities in this era. Most of the studies indicate that often students' perceptions of ability decline due to their increased awareness of the skills needed in the workforce (Kaminski, Switzer, & Gloeckner, 2009). Lack of funds, infrastructure facilities, training, and language barriers have also been found as the reasons for the lower exposure on ICTs.

### **2.3 TECHNOLOGY ACCEPTANCE THEORIES AND MODELS**

Theory is 'a set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena' (The American Heritage Dictionary entry, 2013). Theories provide a set of explanatory variables which can be used to describe the causal relationship for the occurrence of events under investigation to predict phenomena. A model is defined as a systematic description of a system, a theory or a phenomenon that accounts for its known or inferred properties and may be used for further study of its characteristics. A model is any abstract representation of some portion of the real world, constructed for the purpose of understanding, explaining, predicting or controlling a phenomenon being investigated (Burch, 2003).

User acceptance of any information technology for intended purposes have been modeled and predicted using theories. The main objectives of many of those studies were to investigate how to promote usage and also explain what hinders acceptance and usage of technologies (Kripanont, 2007). The present study also aims at investigating the factors affecting the use and acceptance of ICTs by students in Sri Lankan universities in order to promote the usage of a rapidly increasing vast array of information through new modes of technologies and therefore there is a need to explore a theoretical basis for the use of ICTs. Many researchers have proposed theories and models of technology acceptance in order to explain and predict user acceptance with technology in order to account for rapid change in both technologies and their environment (Oye et al., 2012). A review of the existing technology acceptance theories/ models is therefore important to formulate the current research model. A large number of theories/models have been

designed to explore the acceptance and use of technologies environment. Some of the theories/models that provide the basis for technology acceptance can be portrayed as follows:

### **2.3.1 Cognitive Dissonance Theory (CDT)**

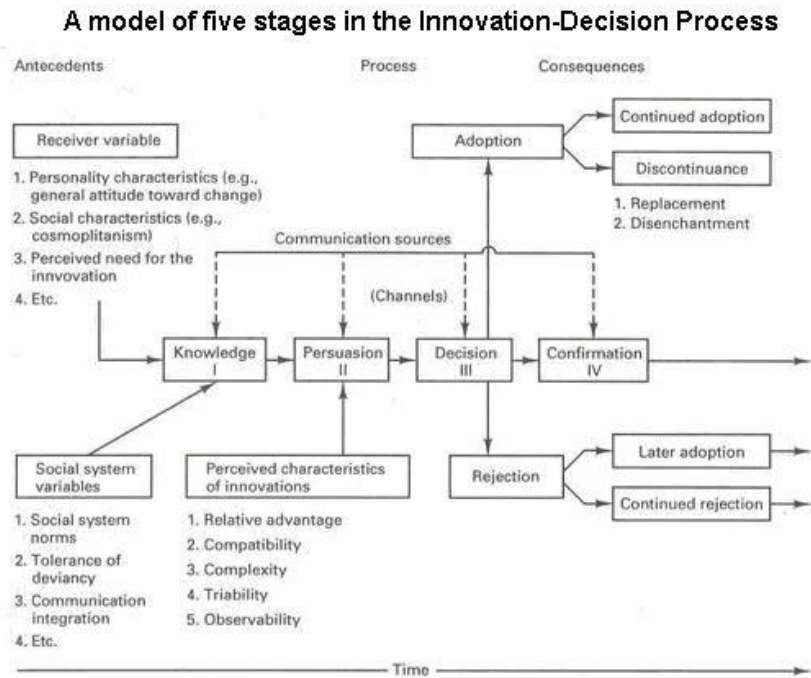
Cognitive Dissonance Theory (CDT) was formulated by Festinger (1957) to explain how discrepancies (dissonance) between one's cognition and reality change the person's subsequent cognition and/or behavior (Bhattacharjee, 2001). This theory depicts a process model of individual behavior whereby users form an initial pre-usage expectation (belief) about a technology experience its usage overtime, and then from post-usage perceptions of the technology. The dissonance between users' original expectations and observed performance is captured in the disconfirmation construct (Bhattacharjee, 2001).

### **2.3.2 Innovation Diffusion Theory (IDT)**

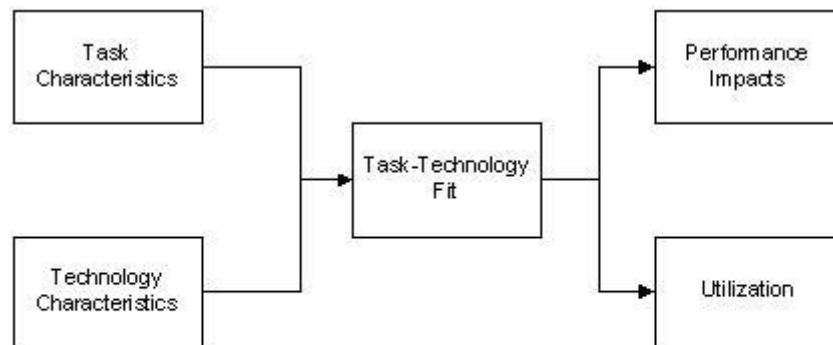
Innovations Diffusion Theory (IDT) (Rogers & Shoemaker, 1971; Rogers, 1995) has been used since 1950s to describe the innovation-decision process. It has gradually evolved until the best well-known innovation-decision process was introduced by Rogers (Rogers & Shoemaker, 1971; Rogers, 1995). Possibly the principal theoretical perspective on technology acceptance is the innovation diffusion theory, which has been applied at both individual and organizational levels of analysis while its primary intention is to provide an account of the manner in which any technological innovation moves from the stage of invention to widespread use (or not) (Andrew Dillon & Morris, 1996). As depicted in Figure 2.1, the innovation-decision process is one through which an individual (or any other decision-making unit) passes (1) from first knowledge of an innovation, (2) to forming an attitude towards the innovation, (3) to a decision to adopt or reject, (4) to the implementation of the new idea, and (5) to the confirmation of this decision (Rogers, 1995).

### **2.3.3 Task Technology Fit Model (TTF)**

Task-Technology Fit (TTF) (Strong, Dishaw, & Bandy, 2006) theory holds that IT is more likely to have a positive impact on individual performance and to be used if the capabilities of the IT match the tasks that the user must perform (Goodhue & Thompson, 1995). The graphical presentation of TTF is in Figure 2.2. TTF consists of eight factors: quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability and relationship with users. TTF has been applied in the context of a diverse range of information systems. TTF measured in conjunction with utilization, is a significant predictor of user reports of improved job performance and effectiveness was attributable to their use of the system under investigation (Goodhue & Thompson, 1995).



**Figure 2.1:** A model of five stages in the innovation- decision process



Source: Goodhue & Thompson (1995)

**Figure 2.2:** Task Technology Fit (TTF) model

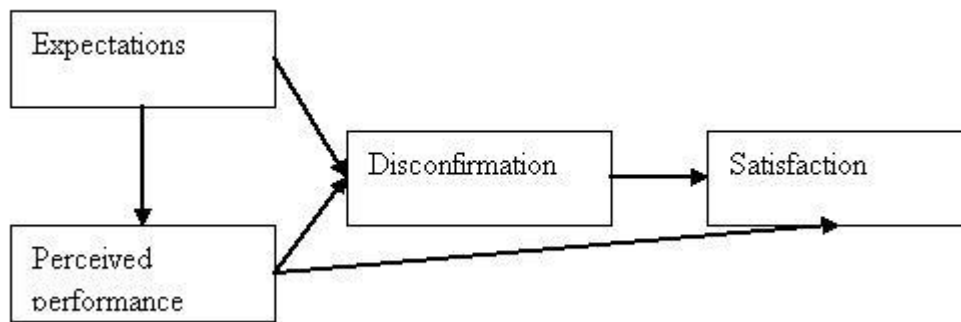
### 2.3.4 Expectation-Disconfirmation Theory (EDT)

Expectation Disconfirmation Theory or Expectation Confirmation Theory (Oliver, 1980) which is built upon the basis of CDT definition and from Marketing has now come to be applied to the adoption of information technology (Bhattacharjee, 2001). EDT focuses in particular on how and why user reactions change over time. As depicted in Figure 2.3, the four main constructs in the model are: expectations, performance, disconfirmation, and satisfaction.

Bhattacharjee (2001) and Bhattacharjee & Premkumar (2004) have integrated the widely employed Technology Acceptance Model (Davis et al., 1989) and EDT to understand technology acceptance intentions over time. In technology acceptance, expectations about technology has



predicted perceived performance, disconfirmation of expectations, satisfaction, and usage persistence intentions (Bhattacharjee, 2001; Khalifa & Liu, 2002; Bhattacharjee & Premkumar, 2004; Hsu, Chiu, & Ju, 2004). This is an important area of research that helps explain the process of adoption by showing how initial expectations are transformed by disconfirmation into satisfaction with technology (Lankton & McKnight, 2007).

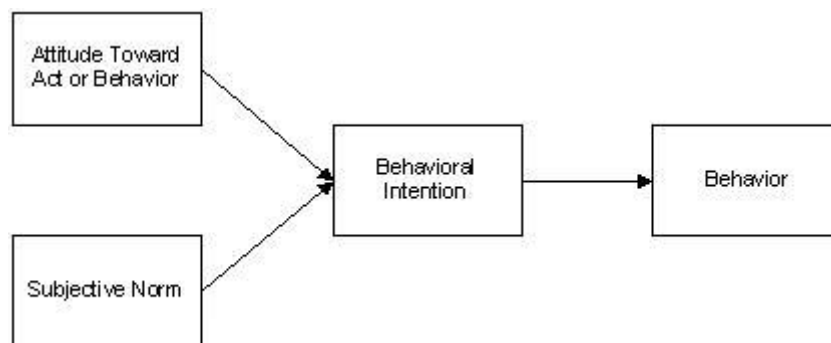


Source: Oliver (1980)

**Figure 2.3:** Model of the Expectation-Disconfirmation Theory

### 2.3.5 Theory of Reasoned Action (TRA)

The first theoretical perspective to gain widespread acceptance in technology acceptance research was the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). TRA is a versatile behavioral theory and models the attitude-behavior relationships. This theory maintains that individuals would use computers if they could see that there would be positive benefits (outcomes) associated with using them. TRA model is depicted in Figure 2.4.



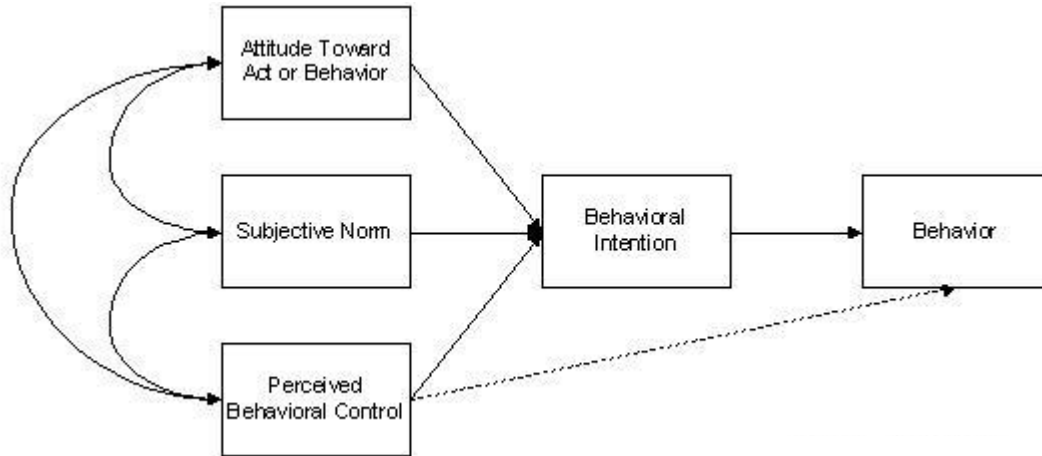
Source: Fishbein & Ajzen (1975)

**Figure 2.4:** Model of the TRA

As shown in the Figure 2.4, TRA posits that individual behavior is driven by behavioral intentions where behavioral intentions are a function of an individual's attitude toward the behavior and subjective norms surrounding the performance of the behavior.

### 2.3.6 Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) (Ajzen, 1985; 1991) is a successor of TRA and has introduced a third independent determinant of intention, perceived behavior control as shown in Figure 2.5.



Source: Ajzen (1991)

**Figure 2.5:** Model of TPB

Perceived behavioral control is determined by the availability of skills, resources, and opportunities, as well as the perceived importance of those skills, resources, and opportunities to achieve outcomes (Kripanont, 2007). As Kripanont (2007) emphasized and as shown in Figure 2.5, by changing these three predictors (attitude, subject norm and perceived behavior control), the chance that the person will intend to do a desired action can be increased and thus increase the chance of the person actually doing it. Although Ajzen (1991) has suggested that the link between behavior and behavioral control outlined in the model should be between behavior and actual behavioral control rather than perceived behavioral control, the difficulty of assessing actual control has led to the use of perceived control as a proxy.

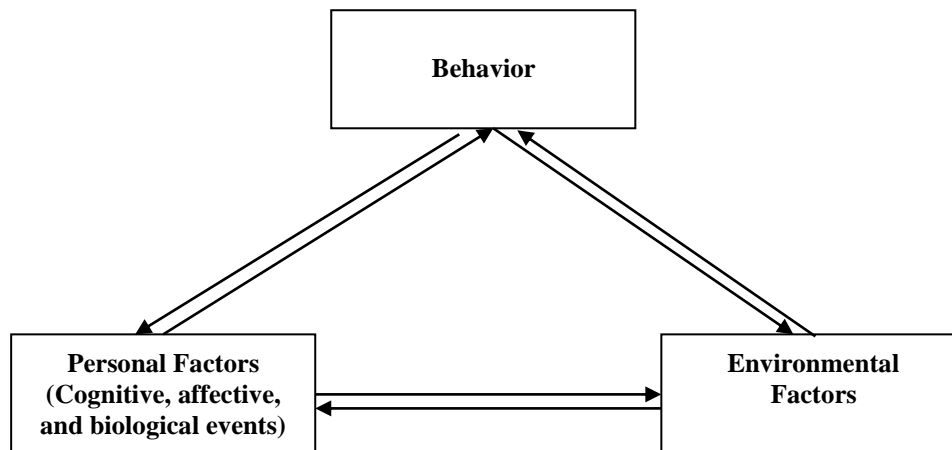
### 2.3.7 Social Cognitive Theory (SCT)

SCT (Bandura, 1986) is based on the basis that environmental influences such as social pressures or unique situational characteristics, cognitive and other personal factors including personality as well as demographic characteristics are equally significant in determining behavior (see Figure 2.6).

In 2007 Kripanont described the SCT as:

“How people interpret the results of their own behavior to inform and alter their environments and the personal factors they possess which, in turn, inform and alter subsequent behavior. This is the foundation of the conception of reciprocal

determinism by Bandura (1986), which views: (a) personal factors in the form of cognition, affect, and biological events, (b) behavior, and (c) environmental influences that create interactions that result in a triadic reciprocity” (Kripanont 2007, pp. 47-48).



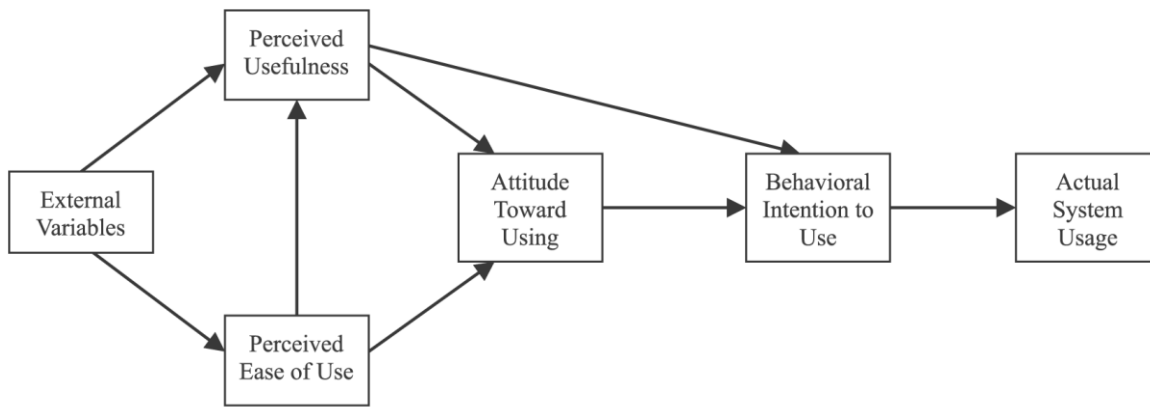
Source: Bandura (1986)

**Figure 2.6:** Model of SCT

Further, more variables, gender, age, and experience, from SCT were researched to find out whether they play an important role in the explanation of the acceptance of ICT (Sutton, 1991; Gefen & Straub, 1997; Reinen & Plomp, 1997; Venkatesh & Davis, 2000; Volman & Eck, 2001; Colley & Comber, 2003; Losh, 2004).

### 2.3.8 Technology Acceptance Model (TAM)

TAM (Davis, 1989) was the first model to mention psychological factors affecting computer acceptance and it was developed from Theory of Reasoned Action (TRA) by Davis (Davis, 1989). Davis (1989) developed and validated better measures through TAM for predicting and explaining technology use. As shown in Figure 2.7, TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with the intention to use serving as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use. The underlying links between two key constructs and users' attitudes, intentions and actual computer usage behavior, were specified using the theoretical underpinning of the TRA. Attitude and perceived usefulness jointly determine the behavioral intention and attitude is determined by perceived usefulness and perceived ease of use.



Source: Davis (1989)

**Figure 2.7: TAM**

Research has shown two central variables, perceived usefulness and perceived ease of use, as explanatory variables which are very important for the explanation of the intention to use ICT and ICT competence (Teo et al., 2009).

### **2.3.9 Model of PC Utilization (MPCU)**

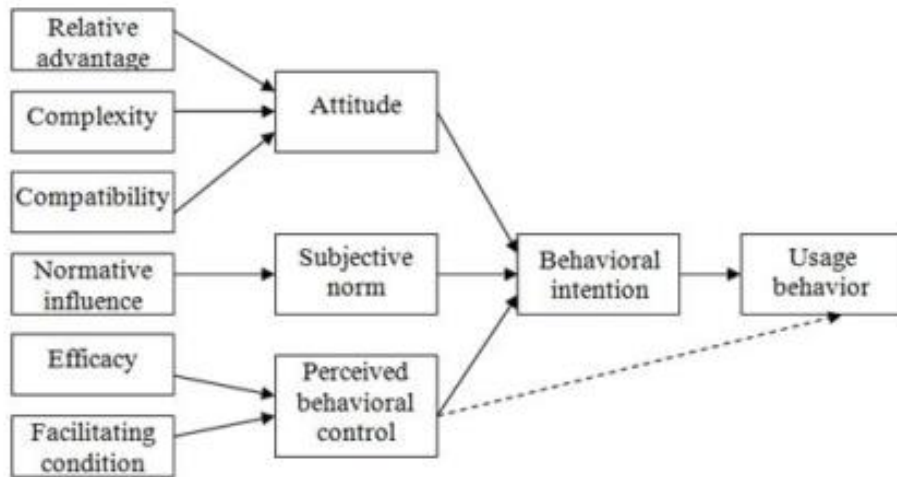
MPCU (Thompson et al., 1991) presents a competing perspective to the theories TRA and TPB and the underpinning conceptual paradigm is theory of human behavior of Triandis (1977). This model predicts the PC utilization behavior. However, the nature of the model makes it particularly suited to predict individual use and acceptance of a range of information technologies (Venkatesh et al., 2003). Thompson et al. (1991) used this to predict usage behavior rather than the intention to use.

### **2.3.10 Motivational Model (MM)**

Motivation theory (Davis, Grover, Becker, & McGregor, 1992) in psychology is the keystone concept behind this model. Several studies have examined motivational theory and adapted it for specific contexts and also applied to understand new technology adaption and use (Venkatesh & Speier, 1999). The core constructs of the theory are extrinsic motivation and intrinsic motivation.

### **2.3.11 Decomposed Theory of Planned Behavior (DTPB)**

The Decomposed TPB (DTPB) introduced by Taylor and Todd explores the dimensions of attitude, belief, subjective norm (social influence) and perceived behavioral control by decomposing them into specific belief dimensions (Taylor & Todd, 1995). Taylor & Todd (1995) suggest decomposing attitudinal belief into three factors: perceived usefulness, perceived ease of use, and compatibility. These three factors have been found to be consistently related specifically to IT usage (Kripanont, 2007). The model is illustrated in Figure 2.8.



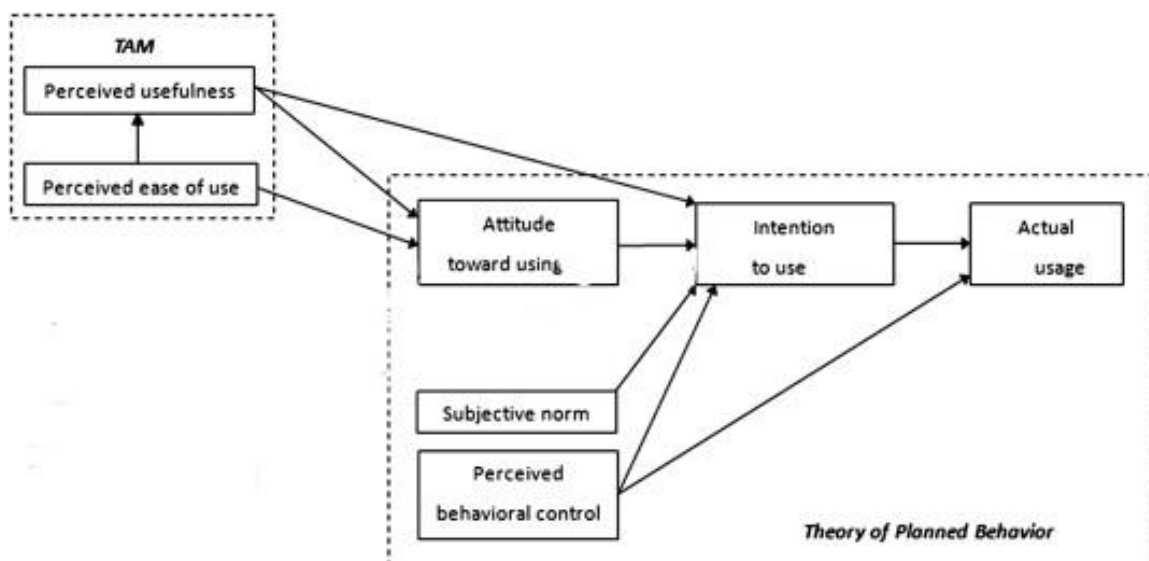
Source: Taylor & Todd (1995)

**Figure 2.8:** Model of the DTPB

Perceived behavior control was decomposed into two constructs: self-efficacy, facilitating conditions (resource and technology). Self-efficacy (Bandura, 1977) is related to perceived ability, and it is anticipated that higher levels of self-efficacy will lead to higher levels of behavioral intention and IT usage (Compeau & Higgins, 1991).

### 2.3.12 Combined TAM and TPB (C-TAM-TPB)

The key determinants of TPB, influence of social and control factors which are not used to measure the behavior in TAM have been joined together to form the C-TAM-TPB. Model (Taylor & Todd, 1995) and is illustrated in Figure 2.9.



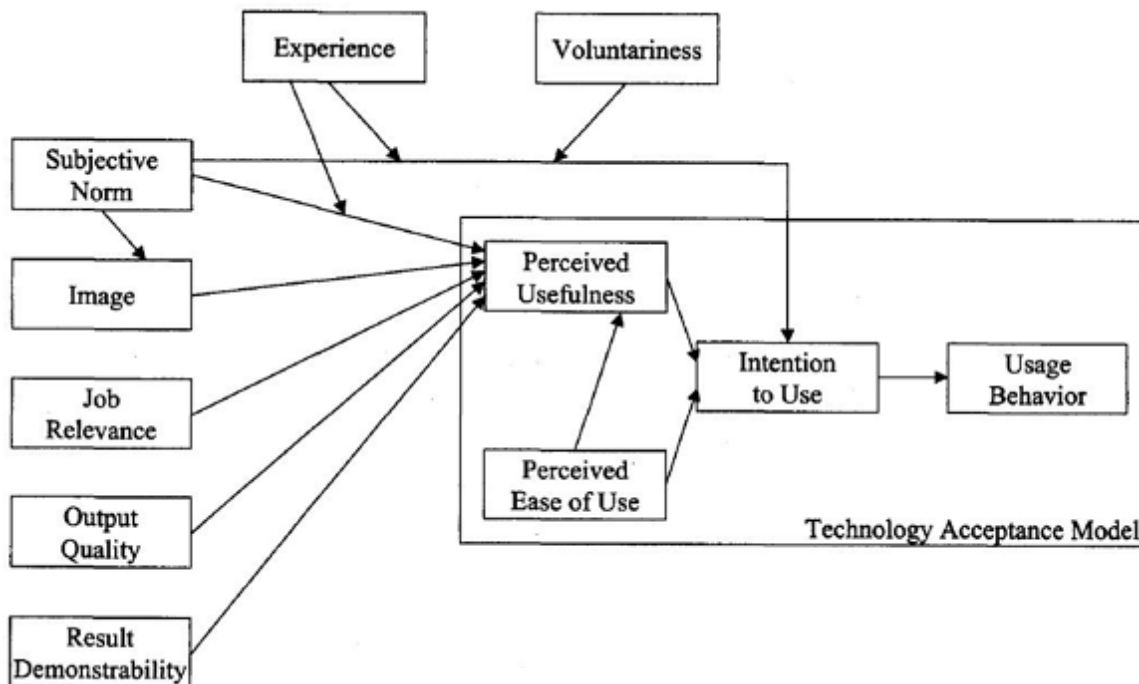
Source: Taylor & Todd (1995)

**Figure 2.9:** Model of C-TAM-TPB

Taylor & Todd in 1995 added two more factors: subjective norm and perceived behavioral control to TAM to provide a more complete test of the important determinants of IT usage, because of their predictive utility in IT usage research and their wide use in social psychology (Taylor & Todd, 1995). This is an adequate model of IT usage for users who are both experienced and inexperienced with a technology system.

### 2.3.13 Technology Acceptance Model 2 (TAM2)

The goal of TAM2 (Venkatesh & Davis, 2000) is a theoretical extension of the TAM to (1) include additional key determinants of TAM that explains perceived usefulness and usage intentions in terms of social influence and cognitive instrumental processes and (2) to understand how the effects of these determinants change with increasing user experience over time with the target technological system (Kripanont, 2007). The model is depicted in Figure 2.10.



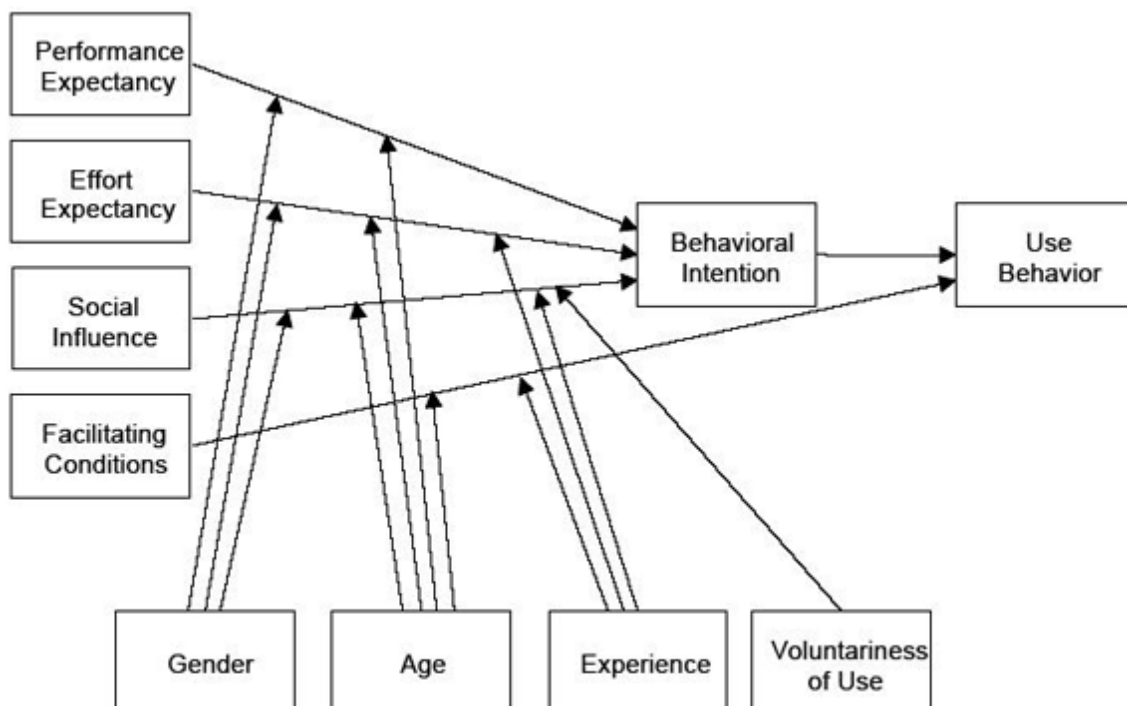
Source: Venkatesh & Davis (2000)

**Figure 2.10:** TAM2 model

According to the study of Venkatesh & Davis (2000) both social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) significantly have influenced user acceptance.

### 2.3.14 The Unified Theory of Acceptance and Use of Technology (UTAUT)

Another important theoretical model was proposed as the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). The UTAUT model stands upon integrating conceptual and empirical aspects of eight previously developed competing models/theories that relate to technology acceptance and use. Theoretical underpinnings include the Theory of Reasoned Action (Fishbein & Ajzen, 1975), Technology Acceptance Model (Davis, 1989), Motivational Model (Davis et al., 1992), Theory of Planned Behavior (Ajzen, 1991), a combination of Technology Acceptance and Theory of Planned Behavior models (Taylor & Todd, 1995), Model of PC Utilization (Thompson et al., 1991), Innovation Diffusion Theory (Moore & Benbasat, 1991; Rogers, 1995), and Social Cognitive Theory (Compeau & Higgins, 1995). Successful integration of key elements from the initial set of 32 constructs from eight theories/models (Venkatesh et al., 2003; Kripanont, 2007; Gronland, 2010) into four core constructs and with four moderator variables, models the UTAUT. As Figure 2.11 depicts, UTAUT proposes three indirect determinants of technology usage behavior (performance expectancy, effort expectancy, and social influence), and two direct determinants of usage behavior (behavioral intention and facilitating conditions). Gender, age, voluntariness, and experience were identified as moderators to indirect and direct determinants of technology use behavior.



Source: Venkatesh et al., 2003

**Figure 2.11:** UTAUT model

Attitude toward using technology, self-efficacy, and anxiety are not theorized to be direct determinants of intention (Kripanont, 2007). The key moderators in the model are gender, age, voluntariness, and experience. From a theoretical perspective, UTAUT (Venkatesh et al., 2003) provides a refined view of how the determinants of intention and behavior evolve over time, and it is important to emphasize that most of the key relationships in the model are moderated (Kripanont, 2007).

#### **2.4 COMPARISON OF TECHNOLOGY ACCEPTANCE THEORIES/MODELS**

Comparison of technology acceptance theories/models in general is vital to position the most suitable theoretical paradigm for the current study. It provides an overall picture of underpinning concepts of theories/models which have been used on the technology acceptance environment.

The underpinning paradigms of theories of CDT and EDT have proved as more relevant to form technology acceptance, through a few studies in the literature (Bhattacharjee, 2001; Bhattacharjee & Premkumar, 2004). Yet, those aspects do not appear to direct the current study sufficiently and they have not received the same level of attention in the available literature as the other theories/models in technology acceptance. CDT and EDT have not been researched in various contexts in technology acceptance.

TRA, TPB, TAM, TAM2 and UTAUT are more popular technology acceptance theories/ models that are being used worldwide in different settings more especially in IS literature. TRA has been adapted for use in many fields and is widely used in academia and business today (Magee, 2002) and has demonstrated validity in the Information Systems literature (Han, 2003). TRA model has some limitations including a significant risk of confounding between attitudes and norms since attitudes can often be reframed as norms and vice versa. The second limitation is the assumption that when someone forms an intention to act, they will be free to act without limitation. In practice, constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act. However, there is also a growing recognition that additional explanatory variables are needed for TRA (Thompson et al., 1991; Webster & Martocchio, 1992).

The Theory of Planned Behavior (TPB) attempts to resolve the limitations of TRA. TPB has been the explicit theoretical basis for many studies over various contextual settings. Therefore, DTPB could provide a more complete understanding of technology usage (Taylor & Todd, 1995). But, Davis et al. (1989) explained that SN scales have a very poor psychometric



standpoint, and may not exert any influence on BI, especially when IS applications are fairly personal while individual usage is voluntary.

Generally, Technology Acceptance Model (TAM) specifies general determinants of individual technology acceptance and therefore can be and has been applied to explain or predict individual behaviors across a broad range of end user computing technologies and user groups (Davis et al., 1989). Simultaneously TAM compared favorably with TRA and TPB in parsimonious capability (Han, 2003). However, TAM is easier to use than TPB, and provides a quick and inexpensive way of gathering general information about an individual's perception of a technology. According to the critical review and meta-analysis of TAM (Legris, Ingham, & Collerette, 2003), claimed the TAM to be a useful model. However many researchers have attempted to expand TAM which has only created confusion (Benbasat & Barki, 2007). Therefore the comparisons confirm that TAM is parsimonious and easy to apply across different research settings; nevertheless, it has to pay the trade-off of losing information richness derived from the studies (Kripanont, 2007).

In a meta-analysis study on TAM with 88 published studies, King & He (2006) concluded that the TAM is a valid and robust model. For the past two decades, substantial empirical evidence has supported TAM. Perceived usefulness, perceived ease of use, social influence, facilitating conditions, attitude, self-efficacy and anxiety together with UTAUT would thus be the basis of the explanation of the usage of new technology (Wu et al., 2007; van Raaij & Schepers, 2008; Wills et al., 2008). Venkatesh et al. (2003) have also added situational variables, gender, age, experience and voluntariness of use to the UTAUT model even though core constructs play a very important role in the explanation of the acceptance and use of technology (Verhoeven et al., 2010; De Wit et al., 2011; Verhoeven et al., 2011). Therefore, the UTAUT has been playing a key role in technology acceptance research and provides a solid base to explain why users accept or reject a technology in a specific perspective.

It is clear however, that these theories/models have been expansively applied in a vast array of research studies in technology contexts and other various areas of academic interest and they have further proven their enhanced applicability in modeling technology acceptance in different contextual settings.

The reviewed literature on technology acceptance theories/models which are relevant to the current study (Bhattacharjee, 2001; Venkatesh et al., 2003; Bhattacharjee & Premkumar, 2004; Kripanont, 2007; van Biljon & Kotzé, 2007; Al-Qeisi, 2009; Dulle, 2010) thus confirm that they

have different premises and benefits. According to Singleton, Straits, & Straits (1993), Taylor & Todd (1995) and Kripanont (2007), despite the specific advantages of each theory, the capability of a theory/model in predicting and explaining behavior is measured by the extent to which the predictors in the theory could account for a reasonable proportion of the variance in behavioral intention and usage behavior. Considerably better variances explain a broader range of phenomena.

Therefore it is necessary to compare them in order to identify the most appropriate ones in respect of their ability to predict and explain individual behavior towards acceptance and usage of technology. Literature reports superior comparisons of technology acceptance models by Venkatesh et al. (2003) and Kripanont (2007). Venkatesh et al. (2003) have compared eight models based on empirical data and Kripanont (2007) has compared nine models based on literature. Therefore the model comparison of Venkatesh et al. (2003) can be concluded as a more pragmatic approach and they have determined individual models' ability to explain behavioral intention (the explained variance  $R^2$ ). Table 2.1 presents a summary of technology acceptance theories/models comparisons in terms of their key constructs, moderators and the explained variance.

Following facts can be drawn from the model comparison in Table 2.1 by examining the constructs, moderators and the explanatory ability.

- Core constructs of the theories/models vary between 2 (TRA and MM) and 8 (IDT). Most of them consist of 3-4 constructs.
- Moderators show a discrepancy from 0-4. MM and SCT have no moderators and the highest is included in the UTAUT. Most common moderator used in these theories/models is the 'experience'.
- The explanatory power of technology usage intention in terms of variance has ranged from 0.36 (TRA, SCT) lowest to 0.69 (UTAUT) highest.

It is evident that moderators can play a significant role on explanatory ability of the theories/models even under situations of similar constructs. Explanatory power of the TAM 2 and TPB is varying with different moderator changes and same constructs from 0.52 to 0.53. and 0.36-0.47 respectively.

Table 2.1

## Technology acceptance theories/models comparison

Theory/Model	Constructs	Moderators	Explained variance (R <sup>2</sup> )
1.Theory of Reasoned Action (TRA)	1. Attitude toward behavior 2. Subjective norm	1.Experience 2. Voluntariness	0.36
2.Technology Acceptance Model - a (TAM2)	1. Perceived usefulness 2. Perceived ease of use 3. Subjective norm	1.Experience 2. Voluntariness	0.53
- b (TAM- including gender)	1. Perceived usefulness 2. Perceived ease of use 3. Subjective norm	1. Gender 2. Experience	0.52
3.Motivation Model (MM)	1. Extrinsic motivation 2. Intrinsic motivation	None	0.38
4.Decomposed Theory of Planned Behavior (DTPB) - a TPB (including voluntariness)	1. Attitude toward behavior 2. Subjective norm 3. Perceived behavioral control	1.Experience 2. Voluntariness	0.36
- b TPB (including gender)	1. Attitude toward behavior 2. Subjective norm 3. Perceived behavioral control	1. Gender 2. Experience	0.46
- c TPB (including age)	1. Attitude toward behavior 2. Subjective norm 3. Perceived behavioral control	1. Age 2. Experience	0.47
5.Combined Technology Acceptance Model and Theory of Planned Behavior (C-TAM-TPB)	1. Attitude toward behavior 2. Subjective norm 3. Perceived behavioral control 4. perceived usefulness	1. Experience	0.39
6.Model of PC Utilization (MPCU)	1. Job fit 2. Complexity 3. Long term consequences 4. Affect towards use 5. Social factors 6. facilitating conditions	1. Experience	0.47
7.Innovation Diffusion Theory (IDT)	1. Relative advantage 2. Ease of use 3. Result demonstrability 4. Triability 5. Visibility 6. Image 7. Compatibility 8. Voluntariness of use	1. Experience	0.40
8.Social Cognitive Theory (SCT)	1.Outcome expectation 2. Self-efficacy 3. Affect 4. Anxiety	None	0.36
9.Unified Theory of Acceptance and Use of Technology (UTAUT)	1. Performance expectancy 2. Effort expectancy 3. Social influence 4.Facilitating conditions	1. Gender 2. Age 3. Experience 4.Voluntariness	<b>0.69</b>

Source: Venkatesh et al., 2003; Kripanont, 2007, Dulle, 2010

According to Taylor & Todd (1995) models should be evaluated in terms of both parsimony (few predictors) and their contribution to understanding. This means that a model with a good explanatory power and a lesser number of variables is well suited. But the researchers have argued that parsimony is not desirable by itself but rather is desirable only to the extent that it facilitates understanding (Venkatesh et al., 2003).

For predictive, practical applications of the model, parsimony may be more heavily weighted; on the other hand, if trying to obtain the most complete understanding of a phenomenon, a degree of parsimony may be sacrificed (Kripanont, 2007). As shown in the Table 2.1 the UTAUT is rich in the explanatory ability in explaining behavioral intention and usage of technology. Therefore, the theory contributes to a better understanding about the drivers of behavior of acceptance and use of new technologies than other similar theories and models (Venkatesh et al., 2003; Kripanont, 2007; Wu et al., 2007; Dulle, 2010). Since current research is aimed at producing a model that could contribute to a practical application and a prediction together with an understanding about the ICT acceptance and use phenomenon, UTAUT seems to be the best theoretical underpinning that should provide a useful tool to assess the likelihood of success for ICT acceptance and use.

## **2.5 THE CULTURAL DIMENSIONS AND ICT USE AND ACCEPTANCE**

The study of use and acceptance of technology is a complex issue especially given its multi-disciplinary subject nature pertaining to psychological, technical, and social contexts (Day, 2006). The difficulty is increased since technology adoption is as much a cultural issue as a rational decision-making process (Im, Hong, & Kang, 2011). Thus, the cultural psychology and psychological anthropology perspective that assesses cultural traits by personality tests at the individual level of analysis should also be considered (Tyler, Allan, & Huo, 2000).

There have been many definitions of the concept of “individual culture” in the social science literature (Al-Qeisi, 2009). However, none of these can be embraced in the same manner since the macro level national cultural phenomena often lack precision in explaining behavior at the individual level (Srite & Karahanna, 2006). According to Straub et al. (2002), most of the definitions of culture depend on the assumption that an individual's membership in any cultural group is influenced and modified by membership in other professional, organizational, ethnic, religious, and various other social groups, each of which has its own specialized culture and value set.

However, a number of dominant frameworks or models have been used in the study of culture in Information Systems research. The most known cultural values and dimensions introduced by

major contributors are presented in Table 2.2. Table 2.2 consists of six different frameworks (Schwartz, 1994; Hofstede, 1997; Trompenaars & Hampden-Turner, 1998) of understanding culture and their seminars of dimensions. Trompenaars & Hampden-Turner (1998) have seven cultural dimensions by surveying managers from twenty different countries. Schwartz (1994) has identified three dimensions; Conservatism / Autonomy, Hierarchy / Egalitarianism and Mastery / Harmony (Voros & Choudrie, 2011). However, the most referred-to framework within the study of culture is Hofstede's dimensions theory.

**Table 2.2**

**Summary for the most known cultural dimensions**

Hofstede (1997)	Schwartz (1994)	Trompenaars and Hampden-Turner (1998)	Chinese Cultural Connection (1987)	Hall (1989)	Kluckhohn and Strodtbeck (1961)
Power Distance	Hierarchy/ Egalitarianism	-	-	-	-
Individualism/ Collectivism	Autonomy	Individualism/ Communitarianism	-	-	Rational Orientation
Masculinity/ Femininity	Mastery/ Harmony	Achievement/ Ascription inner-directed/ Outer-directed	-	-	Man-nature orientation
Uncertainty Avoidance	-	-	-	-	-
Long- Term Orientation	Conservatism	Attitude to Time	Confucian Work Dynamism	Time Perception	Time Orientation
-	-	Specific/ Diffuse	-	Space (personal space & Territory)	Space Orientation (Public & Private)
-	-	-	-	High/Low Context	-

Source: Zakour (2008)

Hofstede's definition is arguably the most predominantly used (Srite & Karahanna, 2006) and he defines culture as "the collective programming of the mind which distinguishes the members of one human group from another" (1980, p. 260). This means that an individual's attitudes, beliefs, and behavior are influenced by their social context and that individuals learn about behavior through the study of the informational and social environment to which they belong (Srite & Karahanna, 2006). Hofstede (1980) provides four widely cited dimensions of culture: individualism/collectivism, power distance, uncertainty avoidance, and masculinity/femininity which are used in individual basis for the current study.

## 2.6 ANALYSIS OF THE APPLICABILITY OF TECHNOLOGY ACCEPTANCE THEORIES/MODELS

This section analyses the empirical applications of technology acceptance theories/models identified, with the aim of determining the extent to which determinants and moderators of these theories/models are pertinent to measure the technology use and acceptance behavior in Sri Lankan university settings.

The diffusion of various aspects of technology/ICT studies that have made a significant contribution towards propagating the knowledge emerging from the past research studies in higher education settings as depicted in *Appendix II*. Those studies further provide opportunities for possible exploration of the conceptualization, methodologies and interpretation of the research.

A majority of the current studies is based on the UTAUT Venkatesh et al. (2003), which comes under Information Systems theory and used in other disciplines including Information Science, Marketing, Social Psychology and Management (see *Appendix II*). Williams, Rana, Dwivedi, & Lal (2011) also showed that the originating article of UTAUT has already been cited by a large number of studies within a short period of time. TAM is the secondly most-used acceptance theory (see *Appendix II*). Also some researchers have claimed that prior to the existence of the UTAUT, TAM was the most widely utilized theory to study IS/IT adoption within the IS discipline (Venkatesh et al., 2003; Dwivedi, Williams, Lal, & Schwartz, 2008; Williams et al., 2011). However, in a systematic literature review conducted in e-learning acceptance by Šumak, Heričko, & Pušnik (2011) found that the TAM is the mostly used theory in e-learning use and acceptance. Their study was not limited to university settings: the most common user type used was students and academics. During TAM's 20 years of existence, it has been utilized by a large number of studies across various business- and management-related disciplines (Williams et al., 2011). However, it appears that UTAUT has become a popular theoretical choice during the last 2-3 years within the field of Information System (IS)/Information Technology (IT) and adoption and diffusion in higher education settings. It is therefore believed that UTAUT will provide a sound theoretical basis for the current study.

According to Venkatesh et al. (2003), technology adoption research can be distinguished between research that focuses on the individual acceptance, in which the behavioral intentions of users, or actual use, are used as a dependent variable, and research that is more focused on implementation success at the organizational level (Šumak et al., 2011). Therefore, there are at various levels within any educational system, different expectations and drivers about

technology's value and adoption on both personal and organizational level (Surry & Ensminger, 2006). However, the number of novel technologies increases and their diverse applicability expands in individuals and organizations level alike. Although, the organizations get used commonly to be updated with the trend in other organizations or countries in technology innovation, individual use and acceptance is limited by various factors. Thus, it may be the reason to focus on individual acceptance and use behavior than organizational, by most of the researchers. It is confirmed by the summary of the literature on ICT adoption in university settings (see *Appendix II*). It shows that only one study has focused on organizational utilization (Kasse & Balunywa, 2013) while all other studies are on individual acceptance and use.

According to Kripanont (2007), theories/models that have been developed and repeatedly tested in studies in other settings may not be equally valid in professional/educational settings. The arguments elaborated in a study of Röcker (2010), has shown that the factors used to predict adoption in existing systems (IT/IS), were not sufficient for explaining the adoption of future ICTs. Also, on similar grounds Venkatesh et al. (2003) recommended further work on identification and testing the additional boundary conditions of the UTAUT model in an attempt to “provide a richer understanding of technology adoption and usage behavior in different organizational and technological contexts”. Hence, it is pertinent to modify the determinants and moderators of UTAUT to suit the specific research environment of the current study by reviewing the empirical applications of UTAUT in university context.

### **2.6.1 UTAUT applications in university settings**

The constant use of UTAUT for the last ten years since its origination attracted the efforts of numerous researchers in analyzing trends and patterns of use and acceptance (El-Gayar & Moran, 2006; Lin & Anol, 2008; Stephan et al., 2009; Verhoeven et al., 2010; Shu & Chuang, 2011; Avci & Askar, 2012; Lin, Lu, & Liu, 2013), illustrating actual performance by employing systematic reviews (Williams et al., 2011), cross cultural validations (Oshlyansky, Cairns, & Thimbleby, 2007; Im et al., 2011) and the meta-analysis approach (Williams et al., 2011) in technology adoption in university contexts.

One of the first steps in establishing the efficacy of a theoretical model is examining its ability for generalization across time, populations, and contexts (Shadish, Cook, & Campbell, 2002). A similar concept has been further identified by Venkatesh, Thong, & Xu (2012) as three broad types of UTAUT extensions/integrations; (1) new contexts such as new technologies, new user populations and new cultural settings (2) addition of new constructs in order to expand the scope of the endogenous theoretical mechanisms outlined in UTAUT and (3) inclusion of exogenous

predictors of the UTAUT variables. Existence of these integrations in the university settings should be reviewed in order to further identify knowledge gaps in the literature which will be covered by the current research.

*Appendix II* clearly shows the development in applicability of UTAUT across the time and that it is vastly diffused. Also, it shows the broad range of contexts such as organizational, individual, technological and cultural, in which generalizability has been examined. In-depth consideration of those contexts will provide a better foundation to fill the knowledge gap through the current research study.

### **2.6.1.1 Context considerations of UTAUT in university settings**

With the intention of comprehensively understanding individual acceptance of technology, it is necessary to infer end user behavior in university settings within at least three contexts: technology context, user population context and the cultural (national) context (Venkatesh et al., 2012), where a context refers to the interrelated conditions in which something exists or occurs (Webster, 2006).

Technology (system) context refers to the end-user computing technologies under investigation, such as any IT innovations, information system applications, and communications technology (Kripanont, 2007). Those ICT tools have usually been adapted by past researchers separately or together. Most of the studies have covered a vast range of technology applications from the basic computer use (Valentín et al., 2013), web 2.0 technologies (Gruzd et al., 2012; Escobar-Rodriguez, Carvajal-Trujillo, & Monge-Lozano, 2013) to the newest concept, cloud computing (Chang, Chiang, & Hopkinson, 2013) in university settings. Further, they were applied within new contexts in university settings, such as E-Library (Ayele & Sreenivasarao, 2013); podcasting (Lin, Zimmer, & Lee, 2013); Wiki/Blog (Avci & Askar, 2012) etc.

Individual/ user population context refers to those essential characteristics of individual users that are related to technology usage (Kripanont, 2007). In university settings a range of users have been exploited for UTAUT testing (see *Appendix II*). Some researchers focused their studies on university teachers (Oye et al., 2012; Thowfeek & Jaafar, 2013), post graduate students (Rahman, Jamaludin, & Mahmud, 2011), library users (Santos-Feliscuzo & Himang, 2011), the whole university community including academics, non-academics, executives, post graduate students and undergraduate students together (Chen, 2011) and the combination of those user categories (Ayele & Sreenivasarao, 2013; Lin et al., 2013). However, most of the studies have focused on students' use and acceptance of any technology tool (El-Gayar &



Moran, 2006; Marchewka et al., 2007; Lin & Anol, 2008; Stephan et al., 2009; Verhoeven et al., 2010; Yoo & Huang, 2011; Tan, 2013 etc.) since they become the leading members of the e-workforce when they leave their universities. Therefore, it is vital to redirect the focus on use and acceptance of ICTs towards students.

The next context to be considered is the culture. Here, the national cultural context, which refers to the macro environment in which the investigated user behavior occurs, should be considered because, it is believed that the national culture also has an impact on an individual's decision-making process towards using a technology (Han, 2003). Most of the UTAUT applications have taken place in western countries and user behavior in other cultural settings needs to be studied to make sure that the knowledge derived from studies in Western countries can be cautiously applied to other cultures particularly.

#### **2.6.1.2 Endogenous/exogenous variable consideration in UTAUT within university settings**

Most of the studies only adapted main constructs of the UTAUT (see *Appendix II*). However, some researchers have adapted external variables for the UTAUT variables in order to better explain the particular technology acceptance environments. Table 2.3 depicts the summary of the endogenous and exogenous predictors used in UTAUT within university contexts.

As depicted in the above Table 2.3, although some studies have used computer self-efficacy, attitude and anxiety or one or two of them as direct determinants of the behavioral intention to use technologies (El-Gayar & Moran, 2006; Marchewka et al., 2007; Yoo & Huang, 2011; Avci & Askar, 2012; Nassuora, 2012), those were included not as direct determinants to the behavioral intention, but as indirect determinants of the UTAUT model (Venkatesh et al., 2003). Further, some studies have adapted a number of exogenous variables for the UTAUT in university settings. Some of them are intrinsic/hedonic motivation (Basar, 2012; Escobar-Rodriguez et al., 2013), personal innovativeness (van Raaij & Schepers, 2008; Lin et al., 2013), education compatibility (Chen, 2011), cultural factors (Thowfeek & Jaafar, 2013), technology task fit (Jing, Jinghua, & Junquan, 2010) and user involvement (Shu & Chuang, 2011) etc. However, different results have been received from most of those studies for particular technologies and particular user categories.

**Table 2.3****Endogenous/exogenous predictors of UTAUT variables used in university settings**

<b>Citation</b>	<b>Endogenous/exogenous predictors</b>
Ayele & Sreenivasarao (2013), Tibenderana & Ogao (2008)	Relevancy, expected benefits
Escobar-Rodriguez, Carvajal-Trijillo & Monge-Lozano (2013)	Hedonic motivation, habit, perceived advantages and perceived relevance
Lin, Zimmer & Lee (2013)	Individual differences (self efficacy, personal innovativeness, prior experience)
Thowfeek & Jafaar (2013)	Cultural factors (power distance, individualism, uncertainty avoidance, masculinity)
Avci & Askar (2012)	Self efficacy and anxiety
Basar (2012)	Intrinsic motivation
Nassuora (2012)	Attitude
Chen (2011)	Education compatibility, technological expectancy
Rahman, Jamaludin & Mahmud (2011)	Information quality, service quality
Santos-Feliscuza & Himangb (2011)	Technical qualities of the software
Shu & Chuang (2011)	User involvement
Yoo and Huang (2011)	Attitude, anxiety
Jing, Jinghua & Junquan (2010)	Perceived cost and task technology fit
Stephan <i>et al.</i> (2009)	Pedagogical paradigm
Lin & Anol (2008)	Online support expectancy, relationship commitment, perceived critical mass
Van Raaij & Schepers (2008)	Personal innovativeness, computer anxiety
Marchewka, Liu & Kostiwka (2007); El- Gayar & Moran (2006)	Attitude, anxiety, self efficacy

Source: Compilation by the author based on literature

In the study of Basar (2012), intrinsic motivation has been tested as a predictor to the behavioral intention and the results revealed that intrinsic motivation does not have any statistically significant effect on the intention to use the student portal. Also, hedonic motivation has been considered as a predictor for the perceived advantage which is believed to have a direct influence on behavior intention in the study of Escobar-Rodriguez et al. (2013) and it has been proved to have a positive influence on perceived advantages of Facebook as a social media platform. Personal innovativeness has been taken as an exogenous variable to performance expectancy and the effort expectancy of UTAUT by two studies (van Raaij & Schepers, 2008; Lin et al., 2013) and it did not exhibit a significant relationship with performance expectancy in both studies but was found as significant for effort expectancy only for teachers in Lin et al.'s (2013) study. The most prominent predictor in the study of Shu & Chuang (2011) has been user involvement; it had

the greatest explanatory power in their study, indicated by the size of the correlation and its statistical significance. This proved that wikis are “customer centric” and require greater user involvement to guarantee their success because of their decentralized and collaborative nature. Therefore, most of them cannot be confirmed as good exogenous predictors for UTAUT on entire ICT use and acceptance behavior within the university context.

Education compatibility has been defined as the degree to which an e-learning system is perceived as being congruent with a student’s learning expectancy. More specifically, it has been referred to as the degree to which an e-learning system complies with the overall learning expectancy of students, including the current learning situation, the learning style, and the preference of conducting learning activities. However, educational compatibility has proven to be the most critical determinant for e-learning acceptance in the study of Chen (2011). This finding means that how a student’s perceptions of technology fit with his/her learning expectancies is more important than perceptions regarding technological usage. Thus, educational compatibility predominates in a student’s decision to accept a technology. This determinant has been seldom considered by prior research. Though the university students are traditionally motivated to use ICTs to successfully face technological improvement in the job market, they tend to use them usually if the technology matches or needs their learning/course requirements. Therefore, educational compatibility will be a better suited predictor of use and acceptance of ICTs in university settings. However, education compatibility is contained in performance expectancy as Venkatesh et al. (2003) defined performance expectancy is the degree to which a student believes that using ICTs will help him or her to attain gains in education/job performance.

### **2.6.1.3 Moderators/ other variable considerations in UTAUT within university settings**

One of the major characteristics in UTAUT is the inclusion of moderator variables. The original TAM did not include any moderating effects. Moderating variable is one that has a strong contingent effect on the independent variable and dependent variable relationship (Serenko, Turel, & Yol, 2006; Kripanont, 2007). That is, the presence of a third variable (the moderating variable) modifies the original relationship between the independent and the dependent variables and moderators can potentially increase the predictive validity of models.

The UTAUT has included experience, voluntariness, gender and age in order to make better prediction and explanation associated with user behavior for a particular technology. Prior research has examined those four factors as the main moderators of beliefs on technology

acceptance (Srite & Karahanna, 2006). A summary of the moderators and other variables used with UTAUT in university settings is depicted in Table 2.4.

**Table 2.4**

<b>Moderators and other variables used in UTAUT in university settings</b>	
<b>Citation</b>	<b>Moderators (other variables)</b>
Ayele & Sreenivasarao (2013)	Gender, age, experience and voluntariness of use, subject discipline, laptop access, skills, awareness
Tan (2013)	Gender
Thowfeek & Jafaar (2013)	Gender, age, qualification, working experience, ethnicity, ICT experience, use of e-learning
Avci & Askar (2012)	Gender, computer usage experience, duration of computer usage, blog-wiki usage status
Basar (2012)	Gender, course taken
Nassuora (2012)	Gender, age
Oye, A.Iahad & Ab.Rahim (2012)	Gender, age, work experience, voluntariness of use and academic status
Pardamean & Susanto (2012)	Gender, blogging experience, age, weekly usage duration of blogs, weekly numbers of posted message, and weekly number of feedback numbers
Chen (2011)	Gender, age, experience, education level, status at the university
Rahman, Jamaludin & Mahmud (2011), Stephan <i>et al.</i> (2009)	Gender, age, experience
Santos-Feliscuzoa & Himangb (2011)	Gender, age, experience, voluntariness and technical qualities
Shu & Chuang (2011)	Bandwagon effect , gender, age, online experience, wiki experience, frequency
Yoo & Huang (2011)	Gender, functional characteristics, experience
Verhoeven, Heerwegh & De Wit (2010)	Gender, age, experience, housing, parents social status, field of study, Internet confidence, learning styles, library visits, equipments, instructions, ICT oriented courses, semester exam marks
Tibenderana & Ogao (2009)	Gender, age, awareness faculty, academic category
Marchewka, Liu & Kostiwa (2007)	Gender, age
Lin & Anol (2008)	Network IT usage, online social support
El-Gayar & Moran (2006)	Gender, age, class status
Li & Kishore (2006)	Gender, general computing knowledge, Weblog-specific knowledge, experience with Weblogs, frequency of using Weblogs

Source: Compilation by the author based on literature

Table 2.4 illustrates that while some researchers have used moderator variables, others have not. Even though most of the researchers have termed some variables as moderators in UTAUT, they have not analyzed the moderator effects (Santos-Feliscuzo & Himang, 2011; Ayele & Sreenivasarao, 2013 etc.).

Other researchers have treated moderators as external constructs in some of the studies. A number of researchers have opted for adding or dropping some of the moderators while others have retained the same variables as those in the original UTAUT model to suit their specific research contexts (Kripanont, 2007; Tibenderana & Ogao, 2008; Shu & Chuang, 2011). Such a concept that has been investigated in the paper of Shu & Chuang (2011) is the ‘peer effect’ or ‘bandwagon effect’. Keynes (1936) stated that facing multiple choices, people tend to confirm their final decision when other people also make the same choice. Since the bandwagon effect does not directly affect the intention to use, it is expected to have a moderator effect on the use of wikis. Results showed that the bandwagon effect has intensified the impact of intention to use wikis on the actual use. However, the bandwagon effect seems to be more suited for specific ICT tools such as wikis and not for general ICT use and acceptance.

#### **2.6.1.4 Hofstede’s cultural factor considerations with UTAUT in university settings**

Reviewed literature revealed that a country’s national culture is an important factor limiting the use and acceptance of ICTs and the role of culture in technology adoption has been examined in many studies (Im et al., 2011). Yet, other studies have been conducted in organizational contexts as well. However, Oshlyansky et al. (2007) have shown that the UTAUT tool is robust enough in providing insight into cross-cultural technology acceptance differences.

Although Im et al. (2011) and Nwabueze et al. (2009) argue that the UTAUT and its predecessors have left out culture as a key antecedent to technology acceptance, including gender which is a fundamental aspect of culture, as a key moderator of the UTAUT Venkatesh et al. (2003) have given evidence by including individual cultural factors into the model. More especially ICT acceptance and the adaptation of Hofstede’s cultural dimensions with UTAUT/TAM in university settings are summarized in Table 2.5.

All the studies presented in Table 2.5 are more recent. It means that the adaptation of well-established Hofstede’s cultural dimensions into the academic domain is a current trend. Some authors have adapted cultural factors as exogenous variables to measure the direct effect on behavior intention or usage of technologies (Suraweera & Liew, 2011; Gogus et al., 2012;

Thowfeek & Jaafar, 2013). Some of them, however, cannot be considered seriously because of certain flaws in the methodology used.

**Table 2.5**

**Relationships between the Hofstede's cultural dimensions used with technology acceptance models in university settings**

Reference	Technology acceptance model used	Hofstede's cultural dimensions	Relationship considered
Thowfeek & Jaafar (2013)	UTAUT (university tutors)	Power distance, Uncertainty avoidance, Individualism vs. collectivism, Masculinity vs. femininity	Direct determinant to the behavioral intention to use e-learning
Gogus, Nistor & Lerche (2012)	UTAUT (professors)	Power distance, Uncertainty avoidance, Individualism vs. collectivism, Masculinity vs. femininity, Long-term orientation vs. short-term orientation	Cross cultural differences in acceptance of Education technology acceptance
Suraweera & Liew (2011)	UTAUT (students)	Power distance, Individualism vs. collectivism, Long-term orientation vs. short-term orientation	Direct determinants to use of e-learning
Sanchez-Franco, Martinez-Lopez & Martin-Velicia (2009)	UTAUT (professors)	Uncertainty avoidance, Individualism vs. collectivism	Moderators to the relationship between determinants and BI to use of web based e-learning
Strite & Karahanna (2006)	TAM (university students)	Power distance, Uncertainty avoidance, Individualism vs. collectivism, Masculinity vs. femininity	Moderators to the relationship between determinants and BI to technology acceptance

Source: Compilation by the author based on literature

However, the existence of cultural differences on technology acceptance has been shown through the studies which have considered the moderating effect of cultural factors between the determinants to the behavior intention to use technologies (Sanchez-Franco et al., 2009). Uncertainty avoidance, masculinity/femininity and power distance emerged as consistent significant moderators of the relationship between subjective norm (social influence) and intended behavior (Strite & Karahanna, 2006). Further, they found that masculinity/femininity had a significant moderating effect on the relationship between perceived ease of use and

intended behavior also. Those studies focused on the availability of cultural differences among a variety of cultural groups but have not established clear relationships between cultural variables and ICT adoption and usage determinants. Also, they have not considered how the model increases the explanatory power in explaining particular technology acceptance environment within a specific group.

## **2.7 SUMMARY OF THE LITERATURE REVIEW**

Though, literature reveals that a large range of ICT tools and applications has become integrated into higher education almost instantly, it does not report an optimal absorption by students. Thus, further exploring the ICT use and acceptance in university settings in order to examine whether they are optimally utilized is imperative and it seems to have been largely ignored in Information Science, as is evident from the paucity of literature in the field. Moreover, it was apparent that a variety of novel ICT tools emerge timely in a mushrooming growth and students rush on them. However, in the UCTIT exams under HETC project in Sri Lanka has affirmed that capability in using MS Word, Excel, Access and Power Point and the Internet searching and social communication networks as the ICT tools in which a student should be skilled (“Outline of the areas covered in the UCTIT exam,” 2014). Further, a phenomenological inquiry would help the researcher to identify the important ICT tools that graduates in Sri Lankan universities should be equipped with.

Overall, the results of the non-theory based studies confirmed that specific differences in individual behavior of ICT use and acceptance in diverse country contexts may exist. Further, the progress seemed to be of a lower rapidity due to poor promotion in exploiting ICTs in Sri Lankan universities. Therefore, the problem domain in the current study fills the gap on knowledge exploring the behavior of university students on use and acceptance of ICTs in Sri Lankan universities.

From the comprehensive critique of fourteen technology acceptance theories/models, it emerges that the UTAUT would be more suited to modeling ICT acceptance and use because UTAUT is generic and can be applied in any particular technology acceptance setting. UTAUT is further well suited to explore the technology use and acceptance behavior since it has given a provision to extend to wider environments with different cultures. Moreover, literature clearly revealed that the UTAUT is the most recently applied theoretical underpinning in most of the technology acceptance theories and therefore an in-depth review of the applications of UTAUT on university settings was performed. Although, a huge number of UTAUT applications have taken place using a variety of ICT tools and user categories, mostly in Western countries on behavior

intention to use technologies, the present study attempts to fill the knowledge gap by contributing to modeling the current usage behavior and intention to future use of ICTs by university students in a non-Western developing country, Sri Lanka. In an in-depth study on the integrations of UTAUT, it was found that the addition of new constructs in order to expand the scope of the endogenous theoretical mechanisms outlined in UTAUT and the inclusion of exogenous predictors of the UTAUT variables can be useful. However, many of those did not seem successful and therefore by scrutinizing those circumstances the researcher will be able to better explain predictors of UTAUT in examining the technology acceptance behavior in the current context.

It was further found that little effort has been taken to establish clear moderation effects on technology acceptance and that there was no study on ascertaining moderating effects of individual cultural factors on UTAUT at all. Therefore, a closer enquiry is desirable in the context of rapidly changing ICTs, because the impact of individual culture may be greater within fast advancing technologies. Finally, a strong requirement exists to explore the ICT use and acceptance behavior in each country, as each country may have its own culture which has been proved as highly influential on technology adoption by many researchers with different levels of importance. University students' behavior on use and acceptance of ICTs are associated with the Sri Lankan culture, and therefore, any findings from previous studies carried out in other countries may have limited relevance.

## **2.8 SUMMARY**

In this Chapter, fourteen well-known theories and models relevant to technology acceptance have been reviewed. In spite of the specific features of each theory, the capability of the theory/model in predicting and explaining behavior has been measured by the extent to which the predictors in the theory could account for a reasonable proportion of the variance. If it is greater, the strength of the model in predicting and explaining the usage behavior and intention to use behavior is greater. Also, a preferable model should be evaluated in terms of both parsimony and its contribution to understanding. Since the current study expects to produce a model of ICT use and acceptance, these well-known theories and models were found to have specific features and significant benefits that will support to develop the theoretical framework of the study. However, the UTAUT seems to be provided a solid base to explain why users accept or reject a technology in a specific perspective and it is very promising in enhancing our understanding of technology acceptance. Therefore, the empirical applications of UTAUT in university settings with incorporation of individual cultural dimensions were further reviewed



and it was concluded that further applications in other technological, user and cultural contexts would have to take place. Therefore, using the above theoretical and empirical understandings, the conceptualization of theoretical framework and hypotheses will be discussed in the next Chapter.

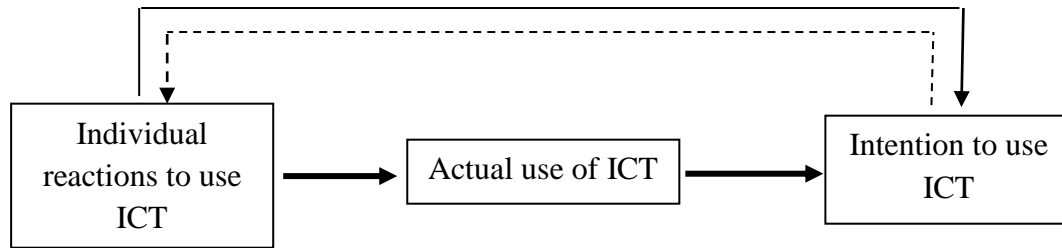
**THEORETICAL FRAMEWORK AND HYPOTHESES****3.1 INTRODUCTION**

The theoretical and empirical literature related to technology use and acceptance was reviewed in Chapter Two by examining the constructs, defining concepts, theories and key conceptual trends of technology acceptance. The purpose of this chapter is to explain and discuss the basic concept of formulation of a theoretical framework and to describe the theoretical framework based on aspects of UTAUT and Hofstede's individual cultural dimensions. The key determinants in the theoretical framework that are expected to influence current use behavior and future acceptance of Sri Lankan university students are proposed and discussed in this chapter. Furthermore, the moderators that are expected to moderate the influence of these key determinants will be discussed and then the research hypotheses will be drawn.

**3.2 BASIC CONCEPTS OF THE THEORETICAL FRAMEWORK**

Technology acceptance can be measured by actual technology use (use behavior) as well as by intention to use (behavior intention) (Moore & Benbasat, 1991; Szajna, 1996). It is evident from previous studies reviewed that the models of technology acceptance which were originally developed and empirically tested concentrated either on behavior intention or use behavior or both behavior intention and use behavior. On the other hand, if the specific technology has been used for a period of time and it is studied cross-sectionally, the actual use behavior was usually measured. In the case of a longitudinal study in dealing with a new technology, behavior intention to use was captured before actual use behavior was measured. This was confirmed by Venkatesh et al. (2003) first investigating behavior intention and then the use behavior from the time of the initial introduction of the technology to stages of greater experience than when they originally developed the UTAUT. Thus, in the longitudinal study, the role of intention as a predictor of use behavior is critical and has been well-established (Ajzen, 1991; Sheppard, Hartwick, & Warshaw, 1988; Taylor & Todd, 1995).

In predicting the future use behavior, measurement of behavior intention is also important as a key dependent variable. More importantly, it is apparent that the experience gained through current ICT use behavior will impact on the intention of using ICTs in the future. This basic concept underlying the user acceptance model of this research was adapted from Venkatesh et al. (2003) (see Figure 3.1).



Source: Venkatesh et al. (2003)

**Figure 3.1: Basic concept of technology acceptance**

As shown in Figure 3.1, Venkatesh et al. (2003) suggest that individual reactions to use ICTs may influence actual use of ICTs and consequently, actual use of ICTs may influence the intention to use technology. Furthermore, it is assumed that individuals' actual use of ICTs will determine their reactions towards continuing to use the new mode of ICTs.

### 3.3 THEORETICAL FRAMEWORK

A theoretical framework, which is also referred to as a conceptual framework is defined as “an assembly of research concepts or variables together with their logical relationships represented in diagrams, charts, graphs, pictographs, flow-charts, or mathematical sets” (Miles & Huberman, 1994, p. 18; Ndunguru, 2007, p. 47). A theoretical framework explains how the researcher theorizes or makes logical sense of the relationships among factors that have been identified as important to the problem being investigated (Kripanont, 2007) and helps in setting up boundaries of the studied phenomena. The critical intent of developing a conceptual framework is to guide researchers to postulate and test certain relationships so as to improve the understanding of the dynamics of the investigated phenomenon.

The theoretical and empirical reviews combine a conceptual justification and contextual applicability of the conceptual underpinnings to examine ICT use and acceptance, in the university context. The following section will present a more comprehensive theoretical framework for the current study, based on the theoretical concepts identified in Chapter Two, which were supported by the existing empirical research literature.

#### 3.3.1 Identification of dependent variables

The dependent variables in this study are Use Behavior (UB) and Behavior Intention to future use (BI). Both dependent variables will be measured and investigated to find out whether use behavior will significantly influence behavior intention to future use ICTs (Kripanont, 2007) in order to form a model which could have power in explaining use behavior and future acceptance of ICTs.

Davis (1989) emphasizes that BI is a proper dimension to examine and predict a UB toward a particular technology. A large amount of research has shown consistent results showing a significant correlation between BI and UB. Furthermore, the path from BI to UB is significant in other models such as TAM, TPB, and DTPB too. As UB is largely influenced by BI, BI plays an important role in predicting UB. However, it is important to note that BI is more predictive of UB when individuals have had prior experience with the technology (Taylor & Todd, 1995). Therefore, taking BI and UB as dependent variables in the current research seems relevant since the ICTs have been introduced early to Sri Lankan universities' environments and therefore the students are experienced to some extent. Further, it is consistent with the original UTAUT model, as it was assumed that the BI has a significant positive influence on UB.

### **3.3.2 Identification of core determinants**

Contextual review demonstrated that quite a number of core determinants pertaining to user acceptance technologies have been identified by previous researchers with a base on UTAUT in the university context. However, inconsistencies in using supplementary constructs (determinants) have also been found in the literature. They are;

1. Even though, the variables, self-efficacy, anxiety, and attitude were theorized not as direct determinants of the behavioral intention to use, but as indirect determinants in the original UTAUT, they have been identified as direct determinants to the behavioral intention to use technologies in some models.
2. Most of those additional determinants were adapted specifically to suit particular technologies and to particular user categories.
3. Most of the time, newly added variables were not significant.
4. Some studies have used exogenous variables whose effects had already been included in the original UTAUT.
5. Some variables were adapted for the UTAUT to examine a particular effect which has not been strictly highlighted in UTAUT. For example, Hofstede's cultural factors have been captured as direct determinants to the behavioral intention to use technology to investigate that particular cultural impact on technology acceptance and use.

The four core determinants established in the original UTAUT were considered as suitable to be adapted for this particular study. They are Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and the Facilitating Conditions (FC).

### 3.3.2.1 Performance Expectancy (PE)

The performance expectancy construct has been established to be the strongest predictor of intentions and has remained significant at all points for all the eight models tested by Venkatesh et al. (2003). Most of the technology acceptance studies which have used UTAUT as the base theory and were conducted in university contexts clearly show PE as the significant predictor for the BI (see *Appendix II*). Previous technology acceptance studies have strongly acknowledged the strength of performance expectancy construct in predicting BI and strong evidence has supported performance expectancy as a direct determinant of UB (Kripanont, 2007). The evidence provides a good rationale to use PE as the direct determinant of UB and BI in the current study and it is expected that PE will significantly determine UB and BI of ICTs. PE is defined and used in this study as:

*“The degree to which an individual student believes that using ICTs will help him or her to attain gains in university performance (Venkatesh et al., 2003, p. 451)”*

### 3.3.2.2 Effort Expectancy (EE)

The effort expectancy construct is said to be significant in both voluntary and mandatory usage contexts during early stages of technology adoption but becomes non-significant over periods of extended and sustained usage (Dulle, 2010). However, EE has been found by many acceptance studies based on UTAUT in university settings to have a significant influence on BI (see *Appendix II*) and Pardamean & Susanto (2012) report that EE is not significant in Blog acceptance and use. Even though, EE was theorized as a direct determinant of BI in a number of other theories and models including TAM, TAM2, and C-TAM-TPB, it was found as a significant determinant for usage behavior too (Kripanont, 2007).

Conversely, it is apparent that ICTs are a rapidly changing aspect with new innovations hastily introduced becoming popular among university students. Therefore, EE is theorized as a direct determinant of the UB and BI in the current study. In this study EE is defined and used as;

*“The degree of ease associated with the use of ICTs (Venkatesh et al., 2003, p. 451)”*

It is expected that this factor would have a significant influence on UB and BI of ICT access by students in Sri Lankan universities.

### 3.3.2.3 Social Influence (SI)

The core construct which is termed as social influence (SI) in UTAUT is represented as a subjective norm in many theories (Venkatesh et al., 2003) including the TRA, TPB, DTPB, TAM2, and C-TAM-TPB. Moreover, other research also has suggested social influence as a

direct determinant of BI (Venkatesh & Davis, 2000). Although studies done in university settings based on UTAUT also have confirmed the significant influence of SI on BI (see *Appendix II*), Schaper & Pervan (2004) found that SI does not have a direct influence on BI.

However, Venkatesh et al, (2003) claimed that “none of the social influence constructs are significant in a voluntary context but become significant when use is mandated”. Although the same idea was further confirmed through the study of Al-Qeisi (2009), Schaper & Pervan (2007) have provided evidence for the contribution of SI on ICT usage under involuntary situations. Considering the above facts, the current study expects to further shed light on whether or not such a determinant is significant in an ICT use environment. With this justification, SI is theorized as a direct determinant of UB and BI in this study and it is expected to determine the intention to use ICTs. Social influence is defined and used in this study as:

*“The degree to which an individual student perceives that other important persons believe he or she should use ICTs (Venkatesh et al., 2003, p. 451)”*

More specifically, it is expected that to find out the extent to which students are influenced by fellow students and lecturers in their ICT use and acceptance at the university.

#### **3.3.2.4 Facilitating Conditions (FC)**

Facilitating conditions (FC) were found to be non-significant in predicting intention but significant in determining usage (Venkatesh et al., 2003; Zhou, Lu, & Wang, 2010). Also, the FC has been modeled as a direct determinant of BI and usage in the theory of DTPB. Moreover, it was found that facilitating conditions were significantly related to the UB and BI to use (Lin et al., 2013) of various types of technology use in university contexts (see *Appendix II*). However, FC did not seem to be much used as the other determinants of UTAUT and therefore it is very important to investigate whether this construct is a direct determinant of UB and BI in ICT use and acceptance in the Sri Lankan university environment.

Having been supported by such evidence FC is theorized as a direct determinant and is expected to influence UB and BI. The facilitating conditions determinant is defined and used in this research as:

*“The degree to which an individual student believes that an institutional and technical infrastructure exists to support use of ICTs (Venkatesh et al., 2003, p. 453)”*

Especially, an assessment of the availability or non-availability of the factors facilitating ICT access would be done in relation to the existing practice of open access usage in the study area.

### 3.3.3 Identification of socio-demographic moderators

A close study of the existing literature undertaken with the objective of identifying users' socio-demographic factors that may affect ICT use and acceptance has not indicated in any way that these factors contribute to the determination of ICT use and acceptance. A considerable number of research studies which used UTAUT as the base theory in university contexts have collected socio-demographic factors of the users and sometimes examined the relationships to suit their specific research contexts. However, a number of research studies indicate that some of these factors have a direct influence or a moderator effect on ICT use and acceptance.

Venkatesh et al. (2003) have verified the strength of four socio-demographic factors (age, gender, experience and voluntariness) which present significant moderating effects on the influence of the determinants on behavior intention. Therefore, the proposed research model seeks to adapt three original UTAUT model moderator variables (age, gender and experience) and to add more factors specifically considered as important under the current study environment.

An original moderator (voluntariness) will be dropped from the current research model due to some inconsistencies as shown by prior research. Students access most of the ICTs voluntarily since it is not mandatory in Sri Lankan universities. Moreover, the majority of the students have to engage in mostly similar ICT applications according to the common subject streams they study in. Therefore, voluntariness is excluded from the model as a moderator, especially as voluntariness is often used under situations where technology usage is mandatory (Venkatesh et al., 2003).

Following the discussions above, it may be concluded that socio-demographic factors may directly or indirectly impact on technology use and acceptance. It is therefore prudent to integrate three socio-demographic factors (age, gender, ICT experience, and the common subject stream), which have been extracted from prior research (see *Appendix III*) into the conceptual model for further empirical investigation in order to identify the impact on ultimate ICT use and acceptance.

#### 3.3.3.1 Age, gender and ICT experience

Age, gender and experience have been included in several UTAUT based models with evidence of significantly moderating the influence of determinants of behavioral intention and use (Venkatesh et al., 2003). As Venkatesh et al. (2003) confirm through their findings, it is established that the effect of performance expectancy and facilitating conditions on behavioral

intention was moderated by gender and age, the effect of effort expectancy and social influence were moderated by age, gender and experience. Moreover, a number of other studies in university settings (Kripanont, 2007; Stephan et al., 2009; Rahman et al., 2011; Oye et al., 2012; Pardamean & Susanto, 2012) considered the above moderators to impart various effects on independent variables towards dependent variables. Therefore, age, gender and experience will be investigated to find out their peculiar effects on various determinants of behavioral intention and use of ICTs.

### **3.3.3.2 Common subject stream**

It was evident that the common subject stream had been investigated as a factor/predictor in the studies on factors that influenced adoption and use of information technology (see *Appendix III*). Therefore, the common subject stream seemed to have an impact on the influence of determinants toward technology acceptance. In the current study common subject streams are considered as a moderating factor. Students engage in a variety of course units in their common subject streams in relevant Faculties. It is perceived that students who engage in different subject streams may have different perceptions and views relating to using ICTs. Thus, the common subject stream is expected to impact the influence of determinant toward current use behavior and intention to future use.

### **3.3.4 Identification of cultural factors**

Based on the perspective that the individual cultural values may affect individual use and acceptance of ICTs and empirical evidence, the well-established four cultural dimensions; Power Distance (PD), Uncertainty Avoidance (UA), Individualism-Collectivism (IC), and Masculinity-Femininity (MF) (Hofstede, 2001; Hofstede & McCrae, 2004) would be adopted to see if they have any impact on ICT use and acceptance environment in Sri Lanka.

#### **3.3.4.1 Power Distance (PD)**

Power distance has been identified as a powerful predictor which can differentiate the technology acceptance with UTAUT in university contexts (Suraweera & Liew, 2011; Gogus et al., 2012; Thowfeek & Jaafar, 2013). However, its explanatory power may change for a model that describes ICT use and acceptance, as a moderator has been measured by Srite & Karahanna (2006) in university settings who found a significant impact on the relationship between subjective norms (social influence) and the behavioral intention to use. Thus, it should be an effective moderator for the current study too and it is adopted expecting that it would have an effect on the relations between determinants towards use behavior or intention to use ICT in Sri Lankan context. Power Distance is defined for the study as:



*“Degree to which, large differentials of power and inequality are accepted as normal by the individual. Power distance will condition the extent to which the employee accepts that his/her superiors have more power (Srite & Karahanna, 2006, p. 682)”*

#### **3.3.4.2 Uncertainty Avoidance (UA)**

As Hofstede (1980) claimed, an uncertainty avoidance group tends to hold lower perceptions of self-efficacy and is more concerned about the risks associated with ICT; and feels anxiety, fewer optimal experiences, when faced with unfamiliar risks, deviant ideas, or conflicts. It further will tend to take time to act until they acquire enough knowledge and information (perceived usefulness and ease of use) to resolve unclear and unstructured situations (Meyers-Levy, 1988). This is further supported by the study of Sanchez-Franco et al. (2009) showing significant moderator effects - attitude towards behavior intention to use web based e-learning and showing a consistent significant moderator effect on the relationship between subjective norms (social influence) and intended behavior. Similarly, Thowfeek & Jaafar (2013) have shown a significant impact of uncertainty avoidance on behavior intention to use e-learning.

Taking into consideration the above facts, uncertainty avoidance will be included in the current research model to test for impact on the influence of determinants towards behavior intention to use or use behavior although there is no previous evidence of this kind of investigation. Uncertainty Avoidance is defined for the study as:

*“The level of risk accepted by the individual, which can be gleaned by his/her emphasis on rule obedience, ritual behavior, and labor mobility. This dimension examines the extent to which one feels threatened by ambiguous situations (Srite & Karahanna, 2006, p. 682).”*

#### **3.3.4.3 Individualism-Collectivism (IC)**

Purpose of education is to learn how to learn in an individualistic cluster, and since students' individual initiatives are encouraged there, they associate according to interests, and this differs from a collectivism cluster, where they associate according to in-groups (Hofstede, 2008). Therefore, students from an individualistic cluster could use ICT because of its potential usefulness for performing learning tasks, but not because of the perceived social pressure (Sanchez-Franco et al., 2009).

While Thowfeek & Jaafar (2013) suggest that there is no impact of individualism-collectivism on behavior intention, Sanchez-Franco et al. (2009) confirm the existence of a significant impact on the influence of perceived usefulness towards intention. With that evidence, individualism-

collectivism is adopted for the current study with the expectation that it will have an impact on the relationship between determinants towards use behavior as well as behavior intention to use ICTs. Individualism-Collectivism is defined in the study as:

*“Degree to which the individual emphasizes his/her own needs as opposed to the group needs and prefers to act as an individual rather than as a member of a group (Srite & Karahanna, 2006, p. 682)”*

#### **3.3.4.4 Masculinity-Femininity (MF)**

Gender differences in technology acceptance were very prominent in the past literature. A plenty of empirical evidence is available to prove the existence of gender differences in technology acceptance (Li & Kirkup, 2007; Madigan et al., 2007; Mahmood, 2009; Kaminski et al., 2009). In accordance with the findings of Venkatesh et al. (2003), it has been found that the effect of performance expectancy, effort expectancy and social influence on behavior intention was moderated by gender.

Even though Kripanont (2007) added gender as a moderator variable to the influence between determinants and the intention and usage behavior, it did not impact the influence of the key determinants toward usage behavior and behavior intention. However, masculinity-femininity has been identified as having a significant moderating effect on the relationships between subjective norms (social influence) and the behavioral intention to use, and on the relationship between perceived ease of use and intended behavior by the study of Srite & Karahanna (2006). Further, masculinity-femininity has been identified as a significant factor on instructors' behavioral intention to adopt e-learning by Thowfeek & Jaafar (2013). Considering these facts masculinity-femininity was added to the current model to further investigate its effect on the influence of determinants towards use behavior and the intention to use. It is defined for the study as;

*“The degree to which, gender inequalities are espoused by an individual. Individuals who espouse masculine values emphasize work goals such as earnings, advancement, competitiveness, performance, and assertiveness. On the other hand, individuals who espouse feminine values tend to emphasize personal goals such as a friendly atmosphere, comfortable work environment, quality of life, and warm personal relationships (Srite & Karahanna, 2006, p. 682)”*

Following the discussion presented above, it may be concluded that core determinants, socio-demographic factors and cultural factors may impact ICT use and acceptance behavior and also the intention for future use. It is therefore prudent to integrate these all these variables into the

conceptual model for further empirical investigation in order to show the impact on ultimate ICT use and acceptance.

### **3.4 THEORETICAL FRAMEWORK OF THE STUDY**

This section outlines and discusses the conceptual model for the study that has been built based on issues that emerged from the review of theoretical and empirical contributions of past studies. Hypotheses of the study derived from the model will be presented later.

Figure 3.2 depicts the conceptual model developed for the study based on the conceptual paradigms, critiques and arguments and from empirical research findings in the area of study, in order to render it more comprehensive, contextualized and feasible for the current study.

The model presented in Figure 3.2, is theoretically parsimonious rather than comprehensive and it reflects the scientific theoretical conceptualization of the technology use and acceptance behavior. It further provides loyal directions derived from the prevailing research literature, first and foremost to ensure its applicability for resolving the problem identified in current study. Then, the model will examine through data gathered in a survey to establish its fitness to the problem domain, and finally, to revise it along with the contextual issues to make it more comprehensive and feasible.

The conceptual model has a number of unique characteristics that makes it suitable for empirical testing. This model elucidates the conceptual underpinning of the UTAUT and the final model formed for ICT use and acceptance behavior of university students, which will be the ultimate outcome of this study. Other than core determinants identified, it incorporates two groups of moderator variables, that is, socio-demographic and cultural, which enable the model to be re-conceptualized to address the issues identified in the research literature.

The research model comprises the four core determinants or constructs (performance expectancy, effort expectancy, social influence and facilitating conditions), two dependent variables (use behavior and behavior intention) and four socio-demographic (age, gender, ICT experience, common subject stream) and four cultural moderators (power distance, uncertainty avoidance, individualism-collectivism and masculinity-femininity) as illustrated in Figure 3.2.

Essentially, the determinants are the perceived variables expected to have an effect on the use and acceptance of ICTs while moderators are the conditions likely to shape the effect of the determinants. More moderators were added based on their demonstrated effects in other studies that could further validate the UTAUT in the Sri Lankan university context.

The conceptual model illustrates four major relationships among determinants, intention, use and the moderators as specified below.

1. Indirect determinants may act as predictors of intention to ICTs. As an example, performance expectancy may predict the intention to use ICTs for a particular phenomenon.
2. Direct determinants may act directly as significant predictors of overall ICT use behavior. As an example 'facilitating condition' directly relates to predict the ICT use behavior.
3. Moderator variables may act as significant predictors of overall ICT use and intention as well. As an example, experience moderates the impact of effort expectancy on intention and impact of facilitating conditions on ICT use behavior.
4. Current ICT use behavior is directly related the behavior intention to future use of ICTs.

### **3.4.1 Hypotheses of the model**

Testable hypotheses are developed to examine whether the theory formulated is valid or not after formulating the theoretical framework (Sekaran, 2003). Two categories of hypotheses were developed based on the constructed model.

1. Direct path hypotheses: hypotheses formulated for direct paths to test the significance of direct paths between key determinants and use behavior.
2. Moderating hypotheses: moderating hypotheses formulated to test the moderating influence of independent variables on dependent variables.

#### **3.4.1.1 Direct path hypotheses**

The direct path hypotheses were formulated in two groups:

1. Hypotheses formulated to test the significant influence of four determinants on use behavior.
2. Hypotheses formulated to test the significant influence between use behavior and behavior intention to use.

#### **3.4.1.2 Moderating hypotheses**

Moderating hypotheses were formulated to test the moderating effect in two categories:

1. Hypotheses formulated to test moderating effect on the relationship between four determinants towards use behavior.
2. Hypotheses formulated to test moderating effect on the influence of use behavior towards behavior intention to use.

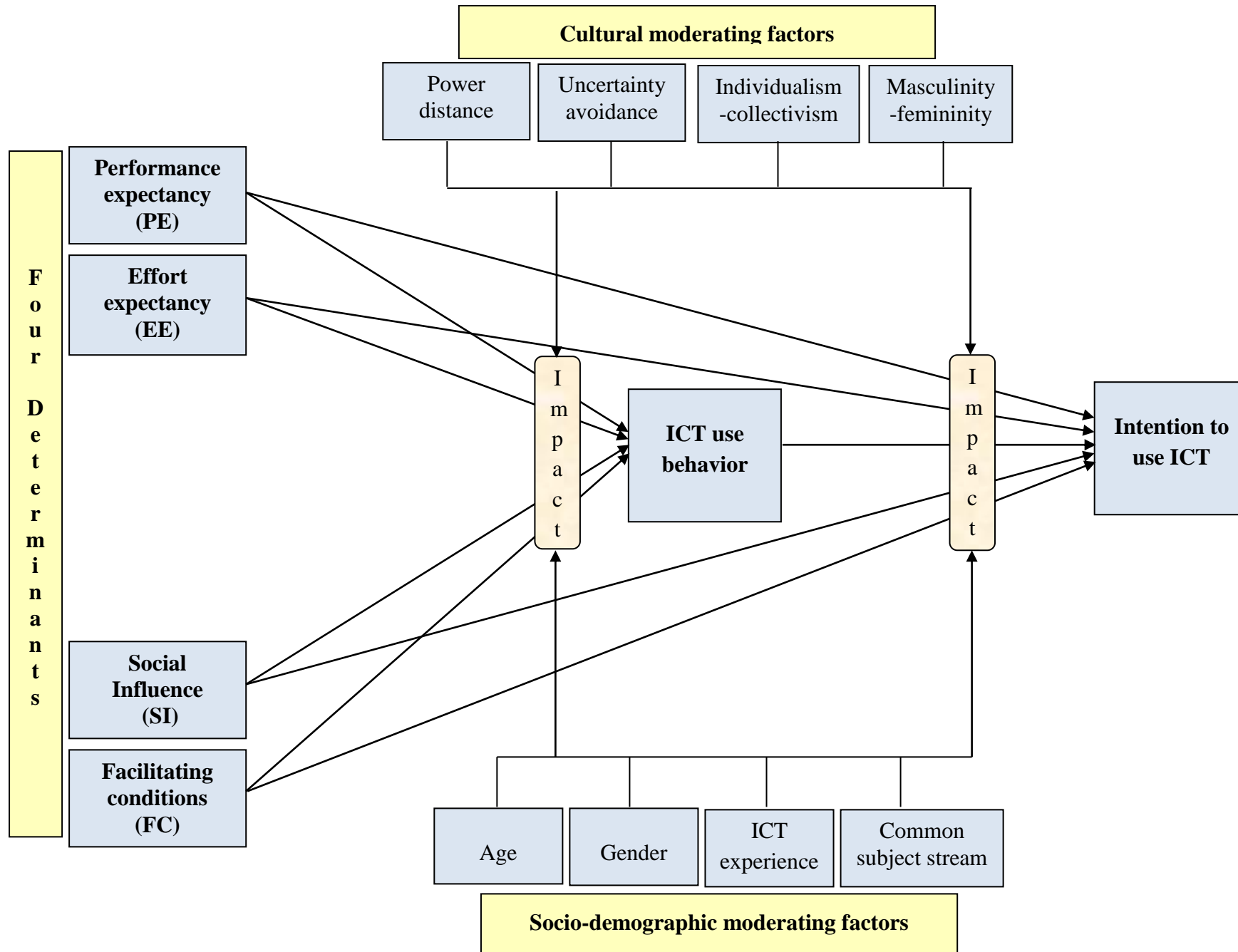


Figure 3.2: Theoretical model of the study

### **3.5 SUMMARY**

This chapter proposes a conceptual research model based on eminent theories/models of technology acceptance together with the findings from prior research which present well-built evidence toward the development of a relevant model. The development of the theoretical framework has been based on an understanding of relationships between core determinants and use behavior, use behavior and behavior intention and the influence of moderators on the influence of these key determinants toward use behavior, and the moderators' impact on the influence of use behavior toward behavior intention. Two categories of hypotheses have been proposed - direct path hypotheses and moderating hypotheses, in order to verify the proposed research model. Major research issues have been identified in this contextual research review, and their implications have been considered in the research design and methodology presented in Chapter Four. Chapter Four outlines the research design and data collection strategies to be employed in obtaining the required data for analysis.



## CHAPTER 4

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### RESEARCH DESIGN AND METHODOLOGY

#### 4.1 INTRODUCTION

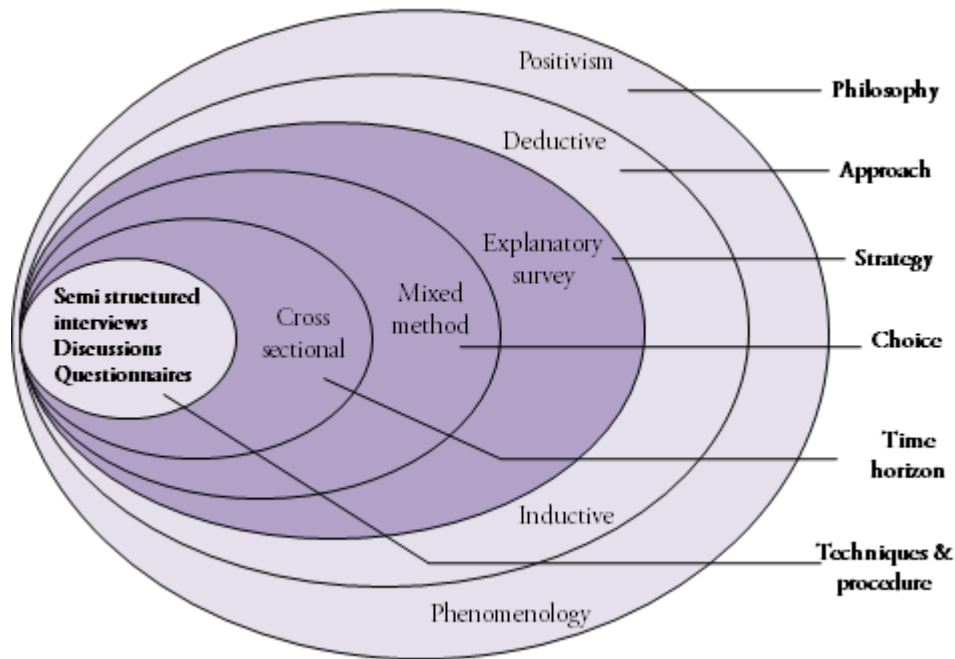
In Chapter Three, the conceptual model of this study was refined on the basis of the outcomes of comprehensive theoretical and empirical research studies existing in the literature, with the objective of redefining or validating the study within real-life settings. This chapter presents the research design and the methodology employed in the study to address the research problem of developing a model to understand ICT use and future acceptance by university students in the Sri Lankan context. The research methodology included the identification of systemic conventions and procedures of the research plan. The research design is presented in two stages. In the first stage, which is the exploratory study, the feasibility of conducting the proposed study was checked in order to examine the present situation regarding ICTs in universities and the job market, identifying the determinants of ICT use and essential ICT tools which a fresh graduate is basically equipped. The second stage, which is the main study, investigates the best parsimonious model through statistical testing. These two stages of the research study treat the design issues as similar and unique to both the stages of the study. The justification of choices and uses will be presented in this chapter. The rationale will be discussed and explained in terms of the research process: design, development of the instrument, pilot study, population, sample, data collection and data analysis. Finally, the summary of the chapter is presented as a prelude to the exploratory study presented in Chapter Five.

#### 4.2 RESEARCH PROCESS

“Research process consists of a series of actions or steps necessary to effectively carry out the research and the desired sequencing of these steps” (Kothari, 2004, p. 56). The research process was adapted from Saunders, Thornhill & Lewis (2009) which is called the “onion” depicted in Figure 4.1. This process enabled the presentation of a detailed description of the research design of the study and provided the basis to identify the issues that emerged when different data gathering techniques were employed (Saunders et al., 2009).

As shown in Figure 4.1, the onion of the research process consists of six major layers, research philosophies, research approaches, research strategies, research choices, time horizons and techniques and procedures which are described in the following sections.





Source: Saunders et al., 2009

**Figure 4.1: The research process onion**

#### 4.2.1 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analyzed and used and it refers to the systematic search for existence of knowledge. The research philosophy adopted for a study contains important assumptions about the way in which the researcher views the world and it is influenced by practical considerations (Saunders et al., 2009). Carson et al. (2001) further claimed that the consideration of the philosophy of research helps to contribute a deeper and wider perspective of research so that specific research projects can have a clear purpose within a wider context. Therefore, it is very important as a foundation at the ground level of research planning and it is a must to streamline the research process of a study.

Though a variety of research philosophies are available, there exist two major philosophical approaches that are especially important for contemporary social research. They are the positivist research approach and the post-positivist (phenomenology/ interpretive) research approach. These are also called the objective and subjective approaches respectively. Positivism is the application of the natural sciences to the study of social reality and it aims to establish cause and effects (Buarki, 2010). That provides a systematic way of direct observation of the social world from an objective viewpoint (Levin, 1988) without interfering with the phenomena being studied (Carson et al., 2001) and free of the values, passions, politics and ideology of the researcher.

Positivist approach which can test theories and establish scientific laws, looks at society as the focus for research, and through the understanding of its internal laws and establishing relevant facts, researchers can in turn help them to understand how and why individuals behave as they do (Walliman, 2006). In the positivistic philosophical approach researchers are interested in the collection of general information and data from a large social sample instead of focusing on details of research. Further, researcher's own beliefs would not influence the research study and it is mainly focused on the observations and experiments to collect numeric data with this approach (Easterby-Smith, Thorpe, Jackson, & Lowe, 2008). Positivism uses quantitative methods to collect data in order to arrive at generalized conclusions (Saunders et al., 2009).

Post-positivism provides an alternative to the traditions and foundations of positivism for conducting disciplined inquiry and the post-positivist approaches assume that reality is multiple, subjective, and mentally constructed by individuals (Crossan, 2003). As Philips (1990) claimed, the researcher interacts with those being researched, and findings are the outcome of this interactive process with a focus on meaning and understanding the situation or phenomenon under examination. The use of flexible and multiple methods is desirable as a way of studying a small sample in depth overtime that can establish warranted assert ability as opposed to absolute truth (Forbes et al., 1999). Hence, phenomenology refers to the way in which researchers as humans make sense of the world around them (Saunders et al., 2009), and the qualitative methodological approaches are adapted (Cohen, Manion, & Morrison, 2000).

The current research aims to examine in a deeper complexity about the use and acceptance of ICTs based on a strong existing theory in the context of universities. It was recognized that the technology use and acceptance behavior has to be understood in qualitative terms first to uncover the real dynamism. Thus, the more advantageous phenomenological research approach was used in the first phase of this study to ascertain the inherent vitality of the problem area to explore ICT use and acceptance environment. Accordingly, as the current research intends to validate quantitative results and to establish causal relationships that explain ICT use and its future acceptance by university students in Sri Lanka in the second phase, the positivist approach is also selected as the better choice for that purpose. Therefore, these two philosophical assumptions were taken in to consideration for the current study.

Research can include elements of both the positivist and phenomenological approaches, if managed carefully and Anderson (1983) further argues that no single best research paradigm can be found in any science, and specifically, that it is not possible to find a single paradigm to evaluate a specific phenomenon. Beynon-Davies (2002) argues that organizations are a part of

the social world and ICT is a part of the physical world. Therefore, both of these positions are valid within this research, in which data were collected on students' ICT use and acceptance behavior through positivist and phenomenological approaches, employing quantitative and qualitative data.

#### **4.2.2 Research Approach**

As Saunders et al. (2009) claimed theory may or may not be made explicit in the design of the research, although it will usually be made explicit in the presentation of the findings and conclusions. The research approach helps to decide what theories are applicable to research issues which help the researcher to adopt the research design to adjust to various constraints and to form hypotheses (Saunders et al., 2009). That is whether the research should use the deductive approach, which attempts to develop a theory and hypothesis (or hypotheses) and design a research strategy to test the hypothesis, or the inductive approach, in which data is collected and a theory is developed as a result of the data analysis (Saunders et al., 2009). Further, they argued that as deduction owes more to positivism and induction to interpretivism, those inspirations possess no real practical value at all.

Since the initial steps of the first phase (exploratory study), aims to study a part of the social world and aspects of human behavior, it takes the characteristics of inductive approach which is not initiated with a theory or any hypotheses and attempts to know what is going on. It aims to identify the phenomenon of interest, and then make observations within that area to identify the evolving patterns and explanations that offer ways of conceptualizing the processes underlying the phenomenon. That basic part subjectively deals with the collection of qualitative data using semi structured interviews/ focus group discussions and expert opinions. The use of the inductive approach to ensure the inclusion of all necessary dimensions is required to understand the inherent dynamic behavior of ICT use and acceptance by university students in Sri Lanka.

The main study of the research would adopt the deductive reasoning approach or a quantitative inquiry. Deductive reasoning leads to a quantitative inquiry. There are some important characteristics in the deductive approach, which reflect the positivist research philosophy. It examines the specific outcome/s of the inquiry, searches to explain causal relationships between variables, develops a hypothesis, and collects quantitative data (Saunders et al., 2009). It is obvious that the deductive approach under the positivist philosophical approach uses a highly structured methodology to facilitate replication (Gill & Johnson, 2002). Therefore, the quantitative approach was considered as the best-suited practice to address the current study

which mainly intends to establish the relationship between various factors and ICT use and acceptance to develop a parsimonious predictive model.

### **4.2.3 Research Strategy**

The next peel of the research onion is the research strategy which may be employed for a research. Research strategy can be used for exploratory, descriptive and explanatory research (Yin, 2003) and they will be guided by research questions and objectives, the extent of existing knowledge, the amount of time and other resources available, as well as philosophical underpinnings (Saunders et al., 2009).

Since the current study is an in-depth empirical investigation which examines the ICT use and acceptance behavior of university students in Sri Lanka, it is designed in multiple stages and each of the stages was set to follow a specific methodology from among a variety of research methods. Therefore, this study has adopted the survey research strategy. Survey is a more popular and common strategy in social sciences research and is most frequently used (Baker, 2001). The survey strategy is usually associated with the deductive approach (Saunders et al., 2009) and it is regarded as being inherently quantitative and to originate from the positivistic tradition (May, 2001). Surveys tend to be used for exploratory and descriptive research (Saunders et al., 2009).

Since the descriptive survey strategy is perceived as authoritative by people in general and is both comparatively easy to explain and to understand, it was selected to describe the nature of the existing situation regarding ICT use and to confirm the factors that affect existing use behavior and acceptance in the future in universities. The explanatory survey strategy was used to identify the relationships between factors and the use behavior in the Sri Lankan university sector since it allows the collection of a large amount of data from a sizeable population in a highly economical way. Thus, the use of the survey research strategy was found to be the best-suited strategy for the study undertaken.

### **4.2.4 Research Choice**

As shown in Figure 4.1, research choice is the next important peel of the research process onion and there are several choices that can be adopted for a particular study. Data collection techniques and data analysis procedures are differentiated by the terms ‘quantitative’ and ‘qualitative’ which are mostly used in social sciences research. Research choice decides on how quantitative and qualitative techniques and procedures are combined (Saunders et al., 2009).

The current study used more than one data collection technique and analysis procedure to answer research questions. In other words, the current research uses multiple methods. As Saunders et al. (2009) further categorized, there are four different possibilities in combining data collection techniques and procedures using some form of multiple methods design. The term multi-method refers to those combinations where more than one data collection technique is used with associated analysis techniques, but this is restricted within either a quantitative or qualitative world view (Tashakkori & Teddlie, 2003). As this study involved two stages with multiple methods in each of them, multi-method research choice was adopted.

#### **4.2.5 Time Horizon**

As Saunders et al. (2009) assured, it is important to decide whether the research is to be a “snapshot” taken at a particular time or is to be a “series of snapshots” and be a representation of events over a given period. They further claimed that it should be decided according to the research questions of a particular study and that time horizons are independent of which research strategy is pursued or the choice of method. The ‘snapshot’ time horizon is called cross-sectional while the ‘series of snapshots’ perspective is called longitudinal.

Cross-sectional studies often employ the survey strategy (Robson, 2002; Easterby-Smith et al., 2008). Cross-sectional time horizon may seek to describe the incidence of a phenomenon (Saunders et al., 2009). The current study examines the ICT use behavior of university students at a given point in time and to explain how factors are related to ICT use and behavior in different universities. The cross sectional study used 1<sup>st</sup> year and 3<sup>rd</sup> year university students. Because the use behavior and the attitudes on ICTs may have changed by 3<sup>rd</sup> year with the institutional ICT environment, it is worthwhile considering 3<sup>rd</sup> year students to study the institutional ICT backup given during the 3 years. It used qualitative and quantitative methods with the survey strategy. Therefore, the time horizon suited for this research was cross-sectional.

#### **4.2.6 Technique and Procedure**

Data collection involves gathering of data using selected techniques in order to achieve the objectives of the study (Onyango, 2002; Kripanont, 2007; Dulle, 2010). Data collection methods are followed by the selected research strategies. Interviewing, administering questionnaires, and observing people and phenomena are the three main data collection methods in survey strategy (Sekaran, 2003; Kothari, 2004; Veal, 2005). Further, Beynon-Davies (2002) affirmed that a combination of several techniques provides “a more complete picture of some phenomenon through exploiting the inherent strengths of each technique”. Thus, allowing for better collection and analysis of data and reaching matching or conflicting results. According to the above, in this

research study, questionnaires, semi structured interviews and focus group discussions were used as the data collecting methods based on the survey strategy.

### **4.3 RESEARCH FRAMEWORK**

Research design based on the research process described above, provides a framework that the research fits into, depending on the theory and nature of the research problem (Buarki, 2010) and it highlights all of the research activities (Walliman, 2006). Research is guided by a theory or theories providing a systematic view of a particular phenomenon and employs theory testing or building. This research is basically focused on testing an existing theory to create new knowledge in the discipline of information sciences.

Current research design is entirely guided by the theoretical framework developed for the study. The purpose of a research design is to present a structure for the collection and analysis of data (David & Sutton, 2004), in a way to achieve the aim of the research (Selltiz, Wrightsman, & Cook, 1976). This research comprised two main phases:

Phase1 - Exploratory study: Feasibility study

Phase 2 - Main study: Model testing

The exploratory study hopes to gather preliminary data on the present situation regarding ICTs in universities and the job market and the main study expects to test the model developed for the study. Reliable statistical assessments and parametric and nonparametric statistical techniques will be carried out to determine the most suitable model for the prediction of the current use behavior and the future acceptance of ICTs by students in Sri Lankan universities. Based on the results of the tests, a parsimonious model will be drawn.

### **4.4 PHASE 1 - EXPLORATORY STUDY**

As the first phase of the research framework, the exploratory study comprises interrelated steps and focuses on gathering preliminary data on ICT use and acceptance in the university and job market environment to check the feasibility of doing the study. Also, it is planned to identify the determinants of ICT use and acceptance and important ICT tools which basically equips a graduate. The methodological design for the identification is depicted in Table 4.1.

#### **4.4.1 Step One: Identify the area of ICT use and acceptance**

The area of the study was identified through a widespread literature survey. It consists of the use and acceptance of ICTs, ICT skills, student perceptions, and so on.

**Table 4.1****Methodological design of the exploratory study**

<b>Step One</b>	Identify the area of ICT use and acceptance (Literature survey)
<b>Step Two</b>	Drawing a list of determinants of ICT use and acceptance and ICT tools which graduates should be skilled with (Comprehensive literature survey)
<b>Step Three</b>	Develop a questionnaire to gather preliminary data on ICT use and acceptance environment and to identify the determinants and important ICT tools
<b>Step Four</b>	Conducting the semi structured interviews/ focus group discussions to gather information (Semi structured interviews/ focus group discussions)
<b>Step Five</b>	Data Analysis (Content analysis, Experts' opinions, Statistical tests)

Source: Compilation by the author

#### **4.4.2 Step Two: Drawing a list of determinants of ICT use and acceptance and ICT tools which graduates should be skilled with**

This step focuses on creating specific lists of determinants of ICT use and acceptance and ICT tools that a fresh graduate should be equipped with. To achieve this, a comprehensive literature survey was employed. Previously used determinants were identified through empirical applications of technology acceptance theories and models based on the literature survey. The list of ICT tools was built in two ways; first reviewing the literature related to ICT in the university context and secondly the literature on employers' demands. Tools were identified by the literature which uses the term 'ICT', 'IT' and 'technology' in their research and specific tools used in the university context. At the level of the employers', literature focusing on identifying ICTs in organizational productivity, and organizational performance in various sectors such as management, higher education, finance etc. were reviewed.

#### **4.4.3 Step Three: Develop a questionnaire to gather preliminary data on ICT use and acceptance environment and to identify the determinants and important ICT tools**

Semi-structured questions (open ended questions) were formulated basically to gather preliminary information on ICT use and acceptance environment in Sri Lanka and to examine the ICT tools and determinants on ICT use and acceptance by university students identified in Step 2. Structured questions were formulated on a five-point Likert scale to identify the degree of important ICT tools listed in step two. The Likert scale is quick and efficient in capturing multiple aspects (Cooper, 2008). The draft questionnaire was tested with experts to determine its' clarity and correctness. The questionnaire is in *Appendix IV*.

#### **4.4.4 Step Four: Conducting the semi structured interviews/discussions to gather information**

The aim of this step was to gather preliminary information on ICT use and acceptance environment on what is happening and why, to get an idea or a feel for what was happening in the situation and to refine the identified determinants and ICT tools which fresh graduates are to be equipped with.

An interview is a purposeful discussion between two or more people (Kahn & Cannell, 1957). The use of interviews is a positive data collection method (Sekaran, 2003) to gather valid and reliable data and therefore interviews may be included in the exploratory stage of a research. In the present study, the interviews were conducted face to face using open-ended questions to collect preliminary information on ICT use and acceptance environment in Sri Lanka. This method has advantages in that the interviewer can adapt the questions as necessary, clarify doubts, and ensure that the responses are properly understood by repeating or rephrasing the question, and could establish friendly relationships and motivate respondents (Kripanont, 2007).

Participants for the interviews are normally chosen using non-probability sampling, often with a specific purpose in mind (Saunders et al., 2009) and Krueger & Casey (2000) refer to such specific participants as being 'information rich'. The semi structured interview schedule for the current study was used with a specific set of participants: eighteen from the university sector and five from various other relevant fields in Sri Lanka. Participants from the university sector consisted of university lecturers, who were in charge of ICT in Faculties of Arts, Science and Management, officers from the Main Computer Centre, Librarian and undergraduates from two universities located in the Colombo, the University of Colombo and the University of Sri Jayewardenepura—and two other universities in remote areas in the country, the University of Ruhuna and the South Eastern University of Sri Lanka which had been selected as the study population in the Main study (see section 4.5.1.1 in p.76). Participants from the other fields comprised human resource persons who were top level persons in charge of recruitment for jobs in Sri Lankan leading fields such as diversified companies, higher education, industrial, administrative and finance. Four (4) discussions were scheduled with students in the selected four universities, that is, one group per university. Each group comprised with students from Arts, Science and Management Faculties. Participant's information collecting sheet of the selected group is given in *Appendix V*. Altogether twenty three interviews/ focus group discussions were scheduled for the current study to collect preliminary data. These interviews were started from December/2013.



As Saunders et al. (2009) claimed in semi-structured interviews the researcher will have a list of themes and questions to be covered, although these may vary from interview to interview and some questions can be omitted in particular interviews, given a specific organizational context that is encountered in relation to purpose. Further, it allows for changing the order according to the flow of the conversation and additional questions can be included exploring the nature of particular objectives. Further they claimed that in a group interview, all participants have the opportunity to state their points of view and answer the questions. Thus, the semi structured interview/group interview method is best suited for the current study since it is an exploratory study that needs to gather information from various sectors.

Each individual was asked questions to answer regarding the ICT use environment in the university and employability respectively. Next, the interviewees were requested to identify the important ICT tools.

#### **4.4.5 Step Five: Data Analysis**

The aim of this step was to explore the preliminary information and to refine the determinants and important ICT tools, as perceived by a specific group. This process was utilized through content analysis of qualitative data, expert opinions and statistical tests.

The preliminary information gathered through interviews and discussions analyzed using content analysis techniques. It was helpful to refine the determinants on ICT use to include to the main survey.

The determinants and the ICT tools drawn by semi structured interviews were reviewed by three ICT professionals who are senior academics in Sri Lankan universities. These three professionals had more than fifteen years' experience in universities, as academics, and they held professional qualifications at the PhD level. The objective of this review process was to finalize the determinants and ICT tools which were identified to use in the current study.

In summary, selecting determinants and important ICT tools for the study was based upon a comprehensive methodology consisting of three methods. Firstly, reviewing the existing literature, and then refining those determinants and tools by semi structured interviews and finally, through the evaluation by a panel of experts and statistical techniques.

To finalize the important ICT tools were further validated through statistical tests. Descriptive statistics were employed for this purpose and then the Friedman Test which is a non-parametric test was used to check the significance of the group means.

## 4.5 PHASE 2 - MAIN STUDY

The methodological design for model testing used in the main study is depicted in Table 4.2.

**Table 4.2**

### Methodological design of the main study

<b>Step One</b>	Conducting a survey to gather information on ICT acceptance and use	
<b>Step Two</b>	Testing the model with data gathered from the main survey	Testing other objectives with the data gathered from the main survey
<b>Step Three</b>	Finding out the best parsimonious model for predicting ICT use and acceptance in the context of universities in Sri Lanka	

Source: Compilation by the author

### 4.5.1 Step One: Conducting the questionnaire survey

Surveys are popular as they allow the collection of a large amount of data from a sizeable population in a highly economical way (Saunders et al., 2009). This step was used to conduct the large empirical investigation to test the constructed model and the other research objectives formulated in Chapter One. The data collected using a survey strategy are wide-ranging as well and can be used to suggest possible reasons for particular relationships between variables and to produce models of these relationships (Saunders et al., 2009) and provide the necessary confidence to the researcher to generalize the results in an acceptable manner (Gable, 1994). The methodological process used for the survey was as follows:

#### 4.5.1.1 Population

Population is the entire set of units for which the survey data is to be used to make inferences and it can also be defined as the eligible population that is included in a research study (Cox, 2008). Thus, the target population defines those units for which the findings of the survey are meant to be generalized. In the current research, all the first year and third year students in the undergraduate programmes in the disciplines of Arts/ Humanities/ Social Sciences, Science/ Applied Science and Management/ Commerce/ Finance (common subject streams) in related Faculties of two universities located in the Colombo metropolitan area, the University of Colombo and University of Sri Jayewardenepura, and of two other universities in rural areas, the University of Ruhuna and the South-Eastern University, were used as the sample population.

It is believed that the use behavior and the attitudes on ICT use and acceptance may have changed at least within two years with the institutional ICT environment and it was the major reason for selecting first year and third year students for the population. The students in the common subject streams, Arts, Science and Management were selected and Medicine,

Engineering and Information Technology (IT) were excluded from the study population since they are the fields with higher employment status and Medicine, Engineering and IT graduates were employed in a field related to their disciplines compared to others (Ramanayake, Jayamanne, Ramyadevipriya, & Perera, 2012). The underlying criterion for selecting those four universities was that they are a fair representation of all fifteen universities in Sri Lanka. The study selected two major universities in Colombo, the University of Colombo which is the oldest in Sri Lanka, and the University of Sri Jayewardenepura, which has the highest student in take in the recent past (UGC statistics, 2010, 2011, 2013) and they are mostly reachable for foreign students too. Two universities from rural areas, the University of Ruhuna which had a considerable student intake (UGC statistics, 2010, 2011, 2013) compared to other universities outside Colombo and the South-Eastern University of Sri Lanka were selected as being reasonably representative of the whole system of universities in the country. The student composition of the South Eastern University in the academic year 2012/2013 was Sinhala-514; Tamil-141; Muslim-686 and other-5 (UGC statistics, 2013) and therefore it is believed that the South Eastern University has an ethnically diverse student population and it is important since the current research aims to explore the individual cultural differences on technology acceptance. The study population is depicted in Table 4.3.

**Table 4.3****Study population of the research**

University	Arts		Management		Science		Total
	1st yr	3rd yr	1st yr	3rd yr	1st yr	3rd yr	
Colombo	888	670	501	430	426	411	3326
Sri J'Pura	993	649	1409	1142	666	423	5282
Ruhuna	642	430	326	321	298	263	2280
South-Eastern	397	159	315	206	102	73	1252
<b>Total</b>	<b>2920</b>	<b>1908</b>	<b>2551</b>	<b>2099</b>	<b>1492</b>	<b>1170</b>	<b>12140</b>

Source: Compilation by the author from statistics available on each university

The target population depicted in Table 4.3 shows a higher number of Management students from the University of Sri Jayewardenepura. As the University has the largest and the oldest Management Faculty and therefore the student intake is relatively bigger (UGC statistics, 2010, 2011, 2013) in the university. The South Eastern University of Sri Lanka is a smaller and newer university and therefore the student intake is also not very high (UGC statistics, 2010, 2011, 2013).

#### 4.5.1.2 Sampling and the sample

Sample population, the drawn sample size from the population and the sampling techniques used for the study are explained in this section.

A sample is a subset of the population, comprising some members selected from the population (Kripanont, 2007). Sample size is the number of items selected from the study population and it should neither be excessively large nor too small but it must be optimum (Kothari, 2004).

**Table 4.4**

**Sample of the study**

University	Faculty	Year of study	Population size	Sample size
<b>Colombo</b>	Arts	1 <sup>st</sup> year	888	155
		3 <sup>rd</sup> year	670	136
	Management	1 <sup>st</sup> year	501	88
		3 <sup>rd</sup> year	430	87
	Science	1 <sup>st</sup> year	426	74
		3 <sup>rd</sup> year	411	83
<b>Sri Jayewardenepura</b>	Arts	1 <sup>st</sup> year	993	110
		3 <sup>rd</sup> year	649	96
	Management	1 <sup>st</sup> year	1409	157
		3 <sup>rd</sup> year	1142	169
	Science	1 <sup>st</sup> year	666	74
		3 <sup>rd</sup> year	423	62
<b>Ruhuna</b>	Arts	1 <sup>st</sup> year	642	150
		3 <sup>rd</sup> year	430	118
	Management	1 <sup>st</sup> year	326	76
		3 <sup>rd</sup> year	321	88
	Science	1 <sup>st</sup> year	298	69
		3 <sup>rd</sup> year	263	73
<b>South-Eastern</b>	Arts	1 <sup>st</sup> year	397	127
		3 <sup>rd</sup> year	159	75
	Management	1 <sup>st</sup> year	315	101
		3 <sup>rd</sup> year	206	96
	Science	1 <sup>st</sup> year	102	33
		3 <sup>rd</sup> year	73	34
<b>Total</b>			<b>12140</b>	<b>2331</b>

Source: Compilation by the author based on statistics available in each university

Roscoe (1975) has proposed some rules for determining sample size. When there exist sub-samples, a minimum sample size of 30 for each category is necessary; in multivariate research, the sample size should be several times (preferably 10 times or more) as large as the number of

variables in the study. Also Neuman (2006) claimed three criteria for a researcher's decision about the best sample size: the degree of accuracy required; the degree of variability or diversity in the population; and the number of different variables were examined simultaneously. However, Saunders et al. (2009) argued that in an ideal situation (manageable population, adequate time and financial resources) the researcher is supposed to study the whole population.

It is believed that sampling is necessary in this study due to the fact that limited time and financial resources would not allow the researcher to study the whole population of 12,140 respondents. The researcher thus aimed at obtaining a representative sample of the population in order to establish the representativeness of the sample to make generalizations about the whole population (Sekaran, 2003). A stratified random sampling method was employed to determine the number of elements required from each stratum. Year of study in each university was the stratum factor in this study, that is, first year undergraduate students and third year undergraduate students. The sample size of the study was determined according to the generalized scientific guideline for sample size decision developed by Krejcie & Morgan (1970) under 95% confidence interval level for each stratum. Then the total number of subjects in each stratum was proportionately distributed among common subject streams. The total sample consisted of 2331 subjects as 19.2% from the target population. Simple random sampling method was used to select the subjects for the study. The proportionately distributed sample among each stratum is depicted in Table 4.4.

#### **4.5.1.3 Main study-data collection**

Data collection involves gathering of data using defined techniques in order to answer the pre-defined research questions of the study (Kripanont, 2007). Data collection method is determined by the chosen research strategies. Main study is the second phase of the research which adopted a quantitative survey research strategy under the positivist nature of the enquiry discussed earlier by means of a questionnaire. The greatest use of questionnaires is made within the survey strategy (Gray, 2004).

A self-administered questionnaire is a fixed format of the tool that eliminates variation in the questioning process, encourages frank responses, where the respondents have adequate time to give well thought-out answers; the tool can be constructed so that quantitative data are relatively easy to collect and analyze (Onyango, 2002; Gray, 2004; Kothari, 2004; Dulle, 2010). Administering a questionnaire is a relatively simple and straightforward approach to extract information on attitudes, beliefs, and motives from the sample, conducted with strict data standardization and control (Adamantis Diamantopoulos & Schlegelmilch, 1997). As Sekaran

(2003) suggests, the advantage of the questionnaire method is that administering questionnaires to large numbers of subjects simultaneously is economical and less time consuming and that it does not require specific skills. Thus, a structured questionnaire can be considered as one of the most appropriate data collection methods.

#### **4.5.1.3.1 Questionnaire**

A questionnaire is a list of carefully structured questions, chosen after considerable testing with a view to eliciting reliable responses from a chosen sample (Hussey & Hussey, 1997). It is an efficient data collection mechanism when the researcher knows exactly what is required and how to measure the variables of interest (Kripanont, 2007).

A questionnaire could be structured or unstructured with regard to the general form of the questions formed. If there are definite concrete and pre-determined response options, questionnaires are called structured questionnaires and the unstructured ones are those with no definitive response (Gray, 2004; Kothari, 2004). The structured questionnaires are simple to administer and provide data which are suitable for statistical analysis (Kothari, 2004; Ndunguru, 2007) and it provides quantifiable results that could be helpful in empirical investigations, and informants find it quicker and easier to answer the questions (Neuman, 2002). On the other hand, unstructured questionnaires are highly challenging when it comes to data analysis. Also the structured questionnaire is free of bias of the researcher and as Sekaran (2003) claimed the bias could be further minimized by focusing on three areas in designing questionnaire: the wording of the questions, planning of issues of how the variables will be categorized, scaled, and coded after receipt of the responses, and the general appearance of the questionnaire. Thus, the current study adapts a structured questionnaire in order to minimize the errors that could occur through questions.

#### **4.5.1.3.2 Questionnaire designing**

Designing questionnaires is important to keep in mind why the research is being done (Ticehurst & Veal, 2000). In designing a well-focused questionnaire, the researcher should use the research objectives, research questions and the formulated research model as a guide. Questions were included in the questionnaire used in this study only when they aligned within the research objectives, research questions and the research model (Dulle, 2010). Also the researcher ensured that questions were easily understood, simple and conveyed one thought at a time to help the researcher to collect more accurate data.

It is applicable to adapt questions or items from previous studies in order to design a suitable and a more reliable questionnaire. For the current research study questions used in the measurement

of the research model were based on the developed and validated items as well as scales from other similar studies including Venkatesh et al. (2003), Srite & Karahanna (2006), Kripanont (2007), Jayasundara (2009) and Dulle (2010).

Considering relevant good practices on questionnaire designing, a questionnaire for the study was designed with close-ended questions. Only one open-ended question was included providing a free space for any additional comments for respondents. Preliminary information gathered through Phase 1 also helped to design the questionnaire. In designing the questionnaire the wordings of questions were considered to be simplified with a view to enabling respondents to easily understand and answer. The questionnaire consists of six parts and multiple questions were also included for the purpose of triangulation. The structure of the questionnaire is depicted in Table 4.5 and the complete version is in *Appendix VI*.

**Table 4.5****Structure of the questionnaire**

<b>Part</b>	<b>Description</b>
A	Focused on identifying the socio-demographic background of students including their experiences with ICTs. It comprised 15 questions all established as nominal scales. Questions were collected from earlier used questionnaires.
B	Focused on determining the predictors that were expected to influence behavior based on theories and models in Chapter Two and Chapter Three of technology use. It comprised 4 questions and all the items were adapted from the original questionnaire of Venkatesh et al. (2003). All the items were established on a 5-point Likert scale.
C	Focused on investigating the current use behavior of ICTs. It comprised two questions: current use frequencies of specific ICT tools and use for specific purposes. This was established on a 5-point scale.
D	Focused on investigating the views of students' concerning their intention to use ICTs in the future. It consisted of 3 questions and those items were adapted from the original article of Venkatesh et al. (2003) and Kripanont (2007). This was established on a 5-point Likert scale
E	Focused on determining the individual cultural factors. It adapted Hofstede's cultural dimensions (1980) and the questionnaire items were adapted from the study Srite & Karahanna (2006) used for the technology acceptance. It included four dimensions and it was established on a 5-point Likert scale.
F	Focused on students' opinions in relation to whether using ICTs could help in improving education and quality of life. It consisted of two main questions with 7-8 items adapted from Kripanont (2007) and the literature review. It was established on a 5-point Likert scale.

Source: Compilation by the author

First, the questionnaire was designed in English Language. Normally, university students have sufficient English knowledge to understand and answer an English questionnaire as most of the courses are conducted in English in universities. Further, there is one ethnic group of students, whose mother tongue is English and some foreign students in Sri Lankan universities. Therefore, the Tamil translation was not used since comparatively a small number of Tamil students were included for the sample. However, majority of the Sri Lankan university students normally use Sinhala language for everyday life. Therefore, the questionnaire was translated to Sinhala and then it was again translated from Sinhala to English to confirm that the translation was equivalent. Finally, both language questionnaires were used appropriately for the survey.

#### **4.5.1.3.3 Pre-testing of the questionnaire**

Pre-testing of a questionnaire is a trial conducted with a specific group of respondents for the purpose of detecting problems in the questionnaire instructions or design (Sekaran, 2003). Pre-testing is important to know whether the respondents have any difficulty in understanding the questionnaire or whether there are any ambiguities or biases. Colleagues, respondent surrogates, or actual respondents could be utilized for the purpose of refining a measuring instrument in the pre-testing procedure (Cooper, 2008).

Validity and the practicability of the questionnaire are assessed by the pre-testing trial. Validity refers to whether a test measures what it actually intends to measure (Jayasundara, 2009). Practicability is an operational requirement of the questionnaire. As Cooper (2008) claimed it needs to be economically, administratively and interpretably feasible to be suited for a large sample. Pre-testing determines the clarity of instructions and questions, repetitiveness and sensitivity of questions, coherence of format and layout, and appropriate length (Jayasundara, 2009). Thus, the pre-testing of the questionnaire is strongly recommended to detect deficiencies in design, administration and wording of questions and Zikmund (2002) suggests that the size of the pre-testing group may be 25 or 50 subjects.

In this study, first pretesting of both questionnaires was carried out during January-February 2014 using 50 students, peers and superiors in two universities: University of Colombo and University of Sri Jayewardenepura. Some suggestions were to modify wordings of both the questionnaires and they were revised. The second pre-testing was done during the first two weeks of March in 2014. Both questionnaires were again revised to incorporate suggestions about wording and inappropriate sequencing by consulting the senior professionals.



#### 4.5.1.3.4 Pilot survey

A pilot study or a feasibility study which is a small-scale version of the larger survey (Kripanont, 2007) is conducted to detect weaknesses in design and instrumentation and to provide proxy data for selection (Dulle, 2010). Since the pilot survey is a small-scale version of the main survey, it is recommended to draw subjects from the target population and simulate the procedures and protocols that have been designed for data collection of the major study. However, it is always proposed to carry out one or more pilot studies before launching the data collection for the main study.

As Ticehurst & Veal (2000), Kripanont (2007) and Dulle (2010) have argued there are a number of objectives and advantages of conducting a feasibility study. Some of them are:

- Improving the internal validity of the questionnaire
- Assessing whether the research protocol is realistic and workable
- Assessing the feasibility of a (full-scale) study/survey
- Establishing whether the sampling frame and technique are effective;
- Identifying logistical problems which might occur in using proposed methods;
- Estimating variability in outcomes to help determine sample size;
- Collecting preliminary data;
- Assessing the proposed data analysis techniques to uncover potential problems

In conclusion the most valuable advantage of the pilot study was that it gave advance warning about where the main research project could fail, where research protocols may not be followed, or whether the proposed methods or instruments are inappropriate or too complicated (van Teijlingen & Hundley, 2001). The size of the pilot group may range from 25 to 100 subjects (Cooper, 2008).

In this study, the pilot survey was conducted during March-April 2014 in two universities, University of Colombo and University of Sri Jayewardenepura using personal visits. Ninety five (95) completely filled questionnaires in both languages could be drawn. With the completion of data collection for the pilot study, data was analyzed using preliminary basic statistical methods including reliability test and validity test using SPSS. As a result, minor changes were made to both questionnaires for their formats in order to improve understanding. Finally, results confirmed that the reliability and validity of the instrument was ensured to use for the main survey.

#### **4.5.1.3.5 Data collection procedure**

Administration of the questionnaires to the pre-determined sample of undergraduates (first year and third year) from the related Faculties of Arts, Management and Science/Applied Science of the selected universities was carried out during May-December 2014. The researcher participated in person when data was collected. The questionnaires were personally distributed to each of the students in the sample during data collection. Only the students who agreed to participate in the survey were requested to complete the questionnaires. This method of data collection was important to ensure a better response rate and it provided an opportunity to the researcher to explain the purpose of the investigation and to answer any queries raised by the subjects. Further, the missing data could be minimized with this engagement.

#### **4.5.1.3.6 Data editing and coding**

Data editing and coding is important before analyzing the data. After coding, data could be stored using statistical software. During data editing, data was checked for errors, omissions, legibility and consistency and they were adjusted accordingly in order to ensure completeness, consistency, and readability of the collected data. Descriptive statistical techniques were used for this process and then data could be coded assigning character symbols, numerical symbols to enter them. The coding sheet is in *Appendix VII* and it consisted of a list of all variables. After entering the data into SPSS, data screening and cleaning was performed in SPSS to ensure that there were no errors at this stage.

### **4.5.2 Step Two: Data analysis**

This section has been designed to discuss the general issues and tests that the researcher employed in the analysis of the pilot survey and the main survey. The analysis was done across all the available data using the IBM SPSS version 21 with AMOS. The in-depth details of the tests used for the data analysis is discussed where appropriate in Chapter Five, Six and Seven.

#### **4.5.2.1 Reliability analysis**

A reliability test is an attempt taken to indicate the extent to which the research tool is free of bias and hence offers consistent measurement across time and across the various items in the instrument (Kripanont, 2007). Reliability of the measures is tested by testing goodness of data.

The most popular test of inter-item consistency reliability is the Cronbach's coefficient alpha (Cronbach, 1951) which was used for the current study in determining the reliability. It tests the consistency of respondents' answers to all the items in a measure and the degree to which the items are independent measures of the same concept, and correlates with one another (Sekaran,

2000). The Cronbach's coefficient alpha values less than 0.6 considered to be poor, those in the 0.7 range, acceptable, those over 0.8 good and those very close to 1.0 even better.

#### **4.5.2.2 Validity test**

Validity is the extent to which the collected data truly reflect the phenomenon being studied (Field, 2005). This is used to assess the instrument's validity and it can be assessed by undertaking content validity, criterion validity or construct validity (Kripanont, 2007). Content validity was achieved by borrowing previously validated items for the measurement of the research model. As noted by Kripanont (2007), the other approach for assessing content validity is to examine the responses from the respondents and the construct validity is determined through assessment of the convergent validity which is synonymous to correlation analysis. In testing the validity of data in the current study, correlation of the measures with each other was considered. The acceptable values range from 0.3 to 0.5 for item-total and inter-item correlations respectively (Field, 2005).

#### **4.5.2.3 Descriptive statistics**

Descriptive statistical techniques such as the minimum, maximum, mean, median, mode, the dispersion of variability (variance, standard deviation, range and quartile deviation), and the shape (skewness) of the data distribution (Cooper, 2008) were employed to produce a complete descriptive profile of the respondents in this study. As Kripanont (2007) noted, there exists a number of benefits in descriptive statistics: describing the characteristics of the sample, checking variables for any violation of the assumptions underlying the statistical techniques used, and addressing specific objectives.

#### **4.5.2.4 Chi-square test**

The Chi-square test is used to determine whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories. It compares the observed and expected frequencies in each category to test that all categories contain the same proportion of values. If the quantitative data is collected in random sampling with one or more categories, the Chi-square test could be employed. In the current study, the group differences observed through percentages were further tested using Chi-square test for statistical significance.

#### **4.5.2.5 Independent-k-sample test (Kruskal-Wallis test)**

The Kruskal-Wallis test is a nonparametric test used to compare three or more samples. It could be used without assuming the data to have a normal distribution. It was used to find out whether

there were any significant differences in the mean scores of current use behavior and the intention to use behavior of ICTs with socio-demographic factors for the current study.

#### **4.5.2.6 Structural Equation Modeling (SEM)**

The Structural Equation Modeling (SEM) was selected to achieve the main objective of the study that was to build up a model of ICT use and acceptance by university students. SEM is a multivariate technique combining aspects of multiple regression which examines dependence relationships and factor analysis which represents unmeasured concepts (latent factors or factors with multiple variables) to estimate a series of interrelated dependence relationships simultaneously (Hair, Black, Babin, Anderson, & Tatman, 2006). Further, SEM is well known as the path analysis uses to form casual relationships in multivariate data in Social Science research. SEM integrates other statistical techniques including ANOVA, analysis of covariance, principal component analysis and classical test theory (Holmes-Smith, 2000).

SEM comprises some benefits when compared to other multivariate techniques to be selected in the current study. As Byrne (2001, 2006) pointed out:

- While most of the other multivariate techniques are essentially descriptive by nature such as exploratory factor analysis, SEM takes a confirmatory approach (hypothesis-testing) to the analysis of a structural theory relating to some phenomenon with two important aspects: the causal processes under study are represented by a series of structural equations, and these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study.
- While traditional multivariate techniques are not capable of either assessing or correcting for measurement error, SEM can provide explicit estimates of error variance parameters.
- While former data analysis techniques are only based on observed measures, SEM procedures can incorporate both unobserved (latent variables) and observed variables as well.
- SEM methodology has many important features available including modeling multivariate relations, or for estimating point and/or interval indirect effects whilst there are no widely and easily applied alternative methods for these kinds of features.

The theorized model was statistically tested using SEM in a simultaneous analysis of the entire set of variables to verify the extent to which it is consistent with the collected data in the specified context.

However, before employing SEM on model generation, it has been recommended to manage data for multivariate analysis. In terms of data management for multivariate analysis, it is essential to examine for missing data, outlier detection and also to test for the assumptions underlying the statistical bases for multivariate analysis; multivariate normality and multicollinearity (Hair et al., 2006).

**Missing data analysis:** In survey research, missing data impacts on the reduction of the sample size available for analysis from an adequate sample to an inadequate sample and statistical results could be biased and lead to erroneous results (Hair et al., 2006). In SEM, computing some fit measures requires fitting the saturated and independence models in addition to the researcher model (Arbuckle, 2007). Further, Arbuckle claimed that some missing data value patterns can make it impossible to fit the saturated model even if it is possible to fit the researcher model. Therefore, Hair et al. (2006) suggests that direct means of assessing the extent of missing data should be by tabulating the percentage of variables with missing data for each case, and the number of cases with missing data for each variable. SPSS facilitates this missing data analysis and that process identifies not only the extent of missing data but any exceptionally high levels of missing data that occur for individual cases or observations. In the current study, the missing data analysis was conducted using SPSS 21 before employing the SEM (see *Appendix VIII*).

**Multivariate outliers:** Outliers are the observations which are substantially different from the remainder of the dataset, that is, as extreme values (Hair et al., 1998). As Kripanont (2007) argued an unusually high or low value on a variable, or a unique combination of values across several variables that make the observation stand out from the others should be detected. Otherwise problematic outliers are not representative of the population and they are counter to the objectives of the analysis and can seriously distort statistical tests (Hair et al., 2006). Thus, the dataset was cleaned to remove outliers employing descriptive statistics.

**Multivariate normality:** One of the basic assumptions of multivariate analysis is the multivariate normality. Normality is correspondence to the normal distribution which is the benchmark for statistical methods and normality can be assessed to some extent by obtaining Skewness and Kurtosis values (Hair et al., 2006). The Skewness value provides an indication of the symmetry of the distribution. Kurtosis provides information about the “peakedness” of the distribution (Pallant, 2005) and it indicates the extent of departure from multivariate normality. In general, Skewness 1 indicates moderate Skewness (Weisstein, 2004) and values of Kurtosis less than 1 are negligible, values 1-10 indicate moderate non-normality while values greater than 10 indicate severe non-normality (Holmes-Smith & Coote, 2006). The Skewness test in descriptive statistics

was used to identify the normality of the database for the current study (see *Appendix IX*). Approximated normality of the endogenous variables were utilized for the model generating in the current study.

The general recommendation is to obtain more data (larger samples) whenever possible when data deviate from normality or are flawed in some way (almost always the case). Further, there are some other ways to deal with variables deviated in normality. These ways are designed for variables that are assumed to have an underlying continuous distribution. For instance, if a Likert scale of self-esteem items to research participants is administered and the scale points tap into points along a continuum of self-esteem, and even though the item data are not continuously distributed, the underlying self-esteem distribution is continuous. Thus, the larger sample (1681 cases) and the Likert scale used in the current study were therefore good enough to assume multivariate normality.

**Multicollinearity:** Higher correlations of variables with each other, is referred to as multicollinearity. Hair et al. (1998) suggest that, while no limit has been set to define high correlations, values exceeding 0.9 needs to be considered, and correlations exceeding 0.8 can often be indicative of problems. Therefore, the value exceeding 0.9 was used as the cut-off point to determine multicollinearity in the current study. There was evidence of multicollinearity of dependent variables so it was essential to consider removing one of them from data analysis. This was achieved when conducting construct reliability and discriminant validity analysis in Chapter Seven.

#### **4.5.2.7 Multi-group moderation**

AMOS' multi-group moderation analysis was used in order to investigate the impact of moderators on the influence of predictors toward dependent variables. In the multi-group moderation analysis, the critical ratios (z-scores) calculated to represent the magnitude of the difference between groups on each of the theorized paths were compared to assess if the standardized effects differed across groups in order to test the group of hypotheses.

#### **4.5.3 Step Three: Model selection**

The best model was formulated using model fit indices provided in AMOS and using the 'model trimming' techniques showed by Kremelberg (2010). The final model selection was done using the goodness of fit adequacy; if it is satisfied then the model argues for the plausibility of the postulated relations among variables; if it is unsatisfied, the tenability of such relations should be rejected.

The goodness of fit index consisted of various types of measures and each type has its specific capability in model evaluation, such as measures of parsimony, minimum sample discrepancy function, measures based on the population discrepancy, in comparison to a baseline model.

***Model Chi-Square ( $\chi^2$ ) measure:*** The chi-square measure is a traditional measure for evaluating the overall model fit. It assesses the magnitude of discrepancy between the sample and fitted covariance matrices' (Hu & Bentler, 1999, p. 2). A good model fit would provide an insignificant result at a 0.05 threshold (Barrett, 2007). Chi-Square measure is in essence a statistical significance test which is sensitive to sample size which means that the Chi-Square statistic nearly always rejects the model when large samples are used (Bentler & Bonett, 1980; Jöreskog & Sörbom, 1996). On the other hand, where small samples are used, the Chi-Square statistic lacks power and because of this may not discriminate between good fitting models and poor fitting models (Kenny & McCoach, 2003). Due to the restrictiveness of this Chi-Square measure, researchers have sought alternative indices to assess model fit and even in the current study, chi-square measure was not much considered as a good model fit measure.

***Minimum Sample Discrepancy Function/DF:*** CMIN/DF is the minimum discrepancy divided by its degrees of freedom; this measure was used in the current study in best model selection. This ratio should be closer to 1 for acceptable models. Arbuckle (2007) claimed that it is not clear how far from 1 it should be to let the ratio get before concluding that a model is unsatisfactory. However, it has been found that this measure is as high as 5.0 (Wheaton, Muthen, Alwin, & Summers, 1977) to as low as 2.0 (Tabachnick & Fidell, 2006) for satisfactory models and that range was considered in model section of the current study.

***Measures of Parsimony:*** A model's simplicity is the parsimony. A model high in parsimony has relatively few parameters and relatively many degrees of freedom. On the other hand, a model with many parameters and a few degrees of freedom is considered as lacking in parsimony. Therefore, it is an important measure in selecting the best suited model and it was considered in the current study.

***Measures Based on the Population Discrepancy:*** The population Root Mean Square Error of Approximation (RMSEA) is the most commonly used measure in model selecting and it was used for the current study too.

***Comparison to a Baseline Model:*** There are many measures to compare the fitted model with a baseline model. The three significant indices; NFI (Normed Fit Index), TLI (Tucker-Lewis

Index), and CFI (Comparative Fit Index) are most commonly used measures and they were also considered in model evaluation in the current study.

**GFI and Related Measures:** GFI is a Goodness-of-Fit Index for ML (Maximum Likelihood) and ULS (Unweighted Least Squares) estimation. AGFI is an Adjusted Goodness-of-Fit Index. They were used in model evaluation of the current study.

Reference levels of this goodness of fit measures considered in model evaluation of the current study are depicted in Table 4.6.

**Table 4.6**

**Reference of model fit indices**

<b>Model fit measure</b>	<b>Indicator</b>
Chi-square ( $\chi^2$ )	A p-value of the $\chi^2$ greater than 0.05 indicates an acceptable fit.
CMIN/DF( $\chi^2$ /df ) or (normed chi-square)	As high as 5.0 (Wheaton et al., 1977) to as low as 2.0 (Tabachnick & Fidell, 2006).
Root Mean Square Error of Approximation (RMSEA)	<0.06 good fit of model (Hu & Bentler, 1999)
Standardized Root Mean Square Residual (SRMR)	Range from 0 to 1.0 with well-fitting models obtaining values less than .05 (Byrne, 1998; Diamantopoulos & Sigauw, 2000), however values as high as 0.08 are deemed acceptable (Hu & Bentler, 1999).
NFI Normed-fit index	$\geq .95$ (Hu & Bentler, 1999).
NNFI (Non- Normed-fit index) or TLI (Tucker-Lewis index)	Recommendations as low as 0.80 as a cut-off have been preferred but Bentler & Hu (1999) have suggested NNFI $\geq 0.95$ as the threshold.
CFI (Comparative fit index)	A value of CFI $\geq 0.95$ is presently recognized as indicative of good fit (Hu & Bentler, 1999).
PGFI ( Parsimony Goodness-of-Fit Index)	$> .90$ (Mulaik et al., 1989).
TLI	.95 (based largely on Hu & Bentler, 1999)
IFI	.95 (based largely on Hu & Bentler,1999)
Akaike Information Criterion (AIC)	The preferred model is the one with the lowest AIC value. (Tanaka, 1993; Akaike, 1974) It is also worth noting that these statistics need a sample size of 200 to make their use reliable (Diamantopoulos & Sigauw, 2000).
GFI	$>0.95$ (Shevlin & Miles, 1998).
AGFI	$>0.9$ well fitting (Tabachnick & Fidell, 2006)

Source: Compilation by the author using literature



#### 4.6 SUMMARY

This chapter presented the plan of the research study and it comprises the mix method approach. The basic plan of the study outlined the methodology used to explore ICT use and acceptance behavior of university students in Sri Lanka. Methodology adopted for the study incorporates the theory testing/building in the field of ICT use and acceptance behavior of university students. The chapter attempted to describe the two phases scheduled for the research; exploratory study and the main study which comprise the primary research components. It further justified the quantitative approach adopted for the research in the main study under positivist philosophy and qualitative characteristics belonging to phenomenological inquiry used in the exploratory study. Then the two phases in detail were described. It discusses data collection methods and data analysis techniques too. The next chapter presents the results of the exploratory study.

## CHAPTER 5

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### EXPLORATORY STUDY-DATA ANALYSIS AND FINDINGS

#### 5.1 INTRODUCTION

Chapter Four discussed the methodological approach that was designed to achieve the aims and objectives of the study. Chapter Five presents the results of the data analysis of the first stage of the research or the exploratory part of the current study. The data collected from semi structured interviews/discussions was analyzed using content analysis techniques and statistical techniques to explore the present situation regarding ICT use and acceptance in universities and the job market, important determinants on technology acceptance and important ICT tools which are mostly relevant to the current job market.

#### 5.2 SEMI STRUCTURED INTERVIEWS

Semi structured interviews were mainly conducted in order to check the feasibility of the study. Moreover, the refining of core determinants and moderating factors included in the model and specification of the important ICT tools for fresh graduates were also considered through semi structured interviews to make sure those are specific to the university context in Sri Lanka.

Twenty three interviews were scheduled using non-probability sampling, often with a specific purpose in mind from the four selected universities and various other fields in Sri Lanka. Eight (8) lecturers who were in charge of ICT in the Faculties of Arts, Science/ Applied Science and Management and five (5) ICT instructors and one Librarian (1) were chosen from the University of Colombo, the University of Sri Jayewardenepura, the University of Ruhuna and the South Eastern University of Sri Lanka. Four (4) focus group discussions were scheduled with students in the selected four universities, that is, one Group Discussion per university. Five (5) other interviews with top level employers who engage in recruitment of employees for jobs in leading fields in Sri Lanka such as diversified companies, higher education, industrial, administrative and finance were also scheduled.

A semi structured schedule was developed to guide the interviews and it is presented in *Appendix X*. The guideline indicates the themes covered by the interviews, underlying principles of selecting them and the method/s employed in the interviews.

Background information of the subjects were included in the interview schedule in order to determine whether selected subjects are suitable to get information on ICT use and acceptance of

undergraduates/graduates in Sri Lanka. Importance and the requirement of ICTs for fresh graduates and the current ICT environment (facilities and courses) of Sri Lankan universities were also planned to be discussed with the subjects to determine whether they are aware of the relationship between the ICT skills of graduates and job market demand. Factors which mainly cause undergraduates/ graduates to use ICTs and the differences experienced by their main subjects in using ICTs were also included with the rationale to examine whether the determinants and moderating factors identified in the literature are relevant for ICT use and acceptance in Sri Lankan universities. Since it was needed to identify the attributes which can be exploited to make full use of ICTs, and recommendations to promote ICT use it was planned to discuss these aspects with the selected participants. Finally, it was planned to derive the commonly important ICT tools for graduates through the interviews.

Data collection for the exploratory study was carried out by personally visiting the relevant universities and other places in which the subjects were selected by the researcher. These interviews were conducted during December/2013-January/2014. Approximately half an hour face to face interview was held with each interviewee. More than one hour was spent for each of the group discussion and students for the group discussion were selected at respective libraries of the selected universities, based on their motivation to participate.

A clear view of the present situation of ICT use/knowledge/skills of graduates in the university context and at the employer's end, relevant factors affecting ICT use and the most important ICT tools which the graduates should be equipped with, could be drawn out from the interviews and the questionnaires.

### **5.3 ANALYSIS OF INTERVIEW DATA**

Analysis of the data collected from semi structured interviews was employed using the content analysis as well as the quantitative techniques in SPSS 16.0 version.

#### **5.3.1 Background information of the interviewees**

Table 5.1 summarizes the background information of participants in different categories.

According to the Table 5.1, twenty four (24) interviews were included in the sample. It consisted of nine (9) ICT coordinating lecturers, five (5) computer instructors, one (1) university Librarian and three (3) groups of undergraduate students where each group consisted of more than ten students from Arts, Science/ Applied Science and Management Faculties from three selected universities and six (6) employers from the job market. However, the sample composition scheduled for the university sector, could not be achieved since practical problems occurred with

the respondents when the researcher visited particular universities. Respondents from the job market could be contacted as scheduled since the researcher made early appointments with them through specific known contacts.

**Table 5.1****Subject dynamics of the exploratory study**

<b>Participants</b>	<b>No.</b>	<b>Gender</b>	<b>Age</b>	<b>Highest qualification</b>	<b>Years of service/ study</b>	<b>Experience ICT (yrs)</b>
University academics (ICT Coordinators) in Arts, Science, Management in selected universities	1	Male	40	PhD	11	13
	2	Male	42	Masters	14	20
	3	Male	37	Masters	10	14
	4	Male	52	PhD	28	25
	5	Male	53	PhD	23	18
	6	Female	32	Masters	6	7
	7	Male	42	PhD	10	10
	8	Female	52	PhD	20	15
	9	Female	28	Masters	4	14
Computer Instructors	1	Male	45	Masters	18	21
	2	Female	37	Masters	8	12
	3	Male	40	MPhil	13	17
	4	Male	26	Bachelor	2	3
	5	Male	48	Masters	20	20
University Librarian	1	Female	59	PhD	30	25
Undergraduate student groups	1	Male /Female	24-26		2-3	5-8
	2	Male /Female	23-25		1-2	3-5
	3	Female	24-26		2-3	5-10
HR Manager-Company	1	Male	38	Masters	12	14
HR Manager-Industrial	1	Male	40	Bachelor	10	14
HR Manager-Industrial	1	Female	38	Bachelor	10	13
HR Manager-Finance	1	Male	60	MPhil	40	15
	2	Male	50	MPhil	30	15
Director/ Recruitment Administrative Officer	1	Male	43	Bachelor	12	10

Source: Compilation by the author

The majority of the participants had considerable experience and experience with ICTs. Moreover, most of them except the students were males and had at least a Bachelors Degree level education. These characteristics of the interviewees helped to achieve the basic objectives of the exploratory study as expected without any issues.

### **5.3.2 Thematic analysis of the interviews**

The interviews were conducted according to the themes indicated in interview schedule (see *Appendix X*). Participants enjoyed responding to the interviews which enabled the researcher to gain a wealth of information. Twenty four (24) interviews/ focus group discussions were conducted with the subjects who are in the university field and the job market field as depicted in Table 5.1.

#### **5.3.2.1 Importance of ICTs for graduates**

All four categories of participants from the university field (ICT coordinating lecturers, ICT instructors in computer labs, librarian, undergraduate students) and from the job market unanimously emphasized the importance of ICT for fresh graduates as a requirement.

Most of the ICT coordinating lecturers and ICT instructors stressed that since each and every industry is information based in this information age and as therefore work processes in all industries are based on ICTs, fresh graduates should be equipped with not only with computer skills but also ICT skills.

One male ICT coordinating lecturer with 10 years working experience in the University of Sri Jayewardenepura described the importance of ICTs as follows:

“ICT is essential without being based on whatever the field is. As an example, we have a student who is an artist. Now, he is a performing artist using computers very well. Moreover, Archaeology students do marvelous visualizations using Google sketch-ups. It is clear that each and every task can be performed using ICTs. So, will there be job opportunities without ICTs?”

They further claimed that basic ICT is an essential component for fresh graduates and advanced ICTs is an advantage in getting jobs. A young (38 years-old) Human Resource Manager with 12 years of his working experience in a reputed diversified company in Sri Lanka stated:

“Fresh graduates should have at least basic skills in using computers and especially Internet searching abilities. So, we conduct a test on Word, Excel, PowerPoint and Internet searching skills to measure their basic ICT capabilities.”

An ICT coordinating male lecturer with a PhD and 23 years working experience in the University of Colombo explained the importance of having ICT skills for graduates in another aspect. He said that:

“Our graduates have to compete with students from International schools where they teach programming languages as PASCAL in grades 6-7. Therefore, our students have to go down even at the local job market without having ICTs on their hands.”

This statement was confirmed by one Human Resources Manager who was 38 years of age and holding a Masters level qualification in a reputed company in Sri Lanka stating:

“We mostly prefer to enroll school leavers from International schools since they are more elegant in handling various novel ICTs than graduates from traditional universities.”

A young ICT coordinating female lecturer from the University of Ruhuna emphasized that past students of her Faculty have been blessed with better jobs based on the certificate given for the compulsory ICT courses conducted in the Faculty. She further showed examples of the graduates who were well skilled in ICTs being promoted in the private sector jobs as well as in the government sector. This was further confirmed by an ICT coordinating lecturer who has qualified with a PhD from the University of Sri Jayewardenepura who stated that:

“Our department has faced a big problem in recruiting temporary instructors with ICT skills because the top ten in the list have already got better jobs. Today I called for the 37<sup>th</sup> student in the list to work as a Temporary Instructor for the Department.”

All the participants from the job market reiterated the same opinion. They highlighted that, higher ICT skills is an advantage for securing better jobs in Sri Lanka. They further stressed that after having their basic training they group new comers according to their skills, and if someone has got equipped with advanced ICT skills he/she would be able to get better positions.

Most commonly, computer instructors in all selected universities agreed on that:

“Though individual Faculties have adequate facilities and courses to promote the ICT acceptance for the students, not all the students have identified the necessity to improve their ICT use. Always, they limit themselves to course content and do not go beyond using various applications even in the Web. Lecturers have to always direct them through assignments or any other engagements.”

However, the students who participated in group interviews voiced their opinions freely disagreeing with what the earlier interviewees had stated. Most of them claimed that they had followed computer courses before entering the university since they had identified the necessity

for ICTs to successfully cope up with this digital era. Some of them believed that it is unable to successfully complete the degree at universities without having ICT experiences and that therefore they had followed ICT courses. Some believed that ICT is a trend and they have to move towards it. A group of students in the Arts stream have started to follow ICT courses outside the university simultaneously while following their degrees at universities to get better opportunities in the job market. This was confirmed by the focus group discussion held at the University of Colombo. They agreed that:

“ICT is essential. It is very important for some job fields. We think all students have identified the necessity in our batch and they follow courses at various institutions. Some senior students have laptops. We have lab facilities, we use them optionally. Some subjects are ICT facilitated. But the problem is we have no added time to use ICTs with our course work.”

The perceptions of the Librarian with her 30 years’ experience in the university sector and the Human Resource Manager from the Garment industry are also given herewith. The Librarian emphasized that:

“New students are knowledgeable on ICTs and this trend has grown during the last 5 years. Knowledge has been confined mostly to e-mail, Facebook, Internet searching and music, You Tube etc. These skills also may be useful for the job market in this networked era.”

The HR Manger endorsed that:

“We check for the qualifications in ICTs of coming graduates. Most of them can manage basic ICTs such as Word, Excel. That capability is enough for us for the preliminary stages.”

However, a different perception was added to this by a Director/ Recruitment in a government ministry and he stated that they have no problem with ICT use with Science graduates, but they have to face problems in recruiting suitable employees from the Arts streams.

However, the students from the Faculty of Arts, University of Ruhuna expressed their ideas in a different way. All of them agreed that:

“Even though ICT is a necessity, it seems that not all have equally identified its importance. Most of the students who identified the importance have followed computer courses before and after entering the university. On the other hand, if there is a

compulsory ICT course in the university, some students only prepare for the tests of that course and thereafter ignore using ICTs continuously.”

According to all these perceptions of the interviewees, it is apparent that basic ICT is considered as an essential component for today’s job market and advanced ICT skills compose a plus point for better positions. It was found that Word, Excel, Power Point, e-mail and Internet searching and its applications are the essential basic ICT tools for fresh graduates. Moreover, it was revealed that even though, most of the students have identified this necessity; still there are some who do not accept ICTs as an essential element. On the other hand, job market employers seek ICT equipped employees. They further put their emphasis on the job market demand with ICTs and believe that a graduate can easily capture the demand by him/herself for their position with advanced ICT skills. Therefore, it is clear that the current study is feasible and relevant.

### **5.3.2.2 Current situation of ICT environment of universities and graduates’ performance on ICTs**

Interviewees from the university sector were asked about the current status of the facilities and compulsory and optional courses offered for the students and the students’ performance with ICTs. Simultaneously, the trend in ICT performance of fresh graduates was questioned from the respondents selected from the job market.

The perceptions of the ICT coordinating lecturers of universities, revealed that introductory ICT courses had been conducted. While Word, Excel, Power Point, Internet searching and e-mail practices were covered through all the courses as the minimum requirement, some courses contained the advanced ICT options. The nature of these courses differed according to the Faculties and the universities. Some were credit based courses and others were non-credit based. Most of the Faculty level courses were compulsory. There were yearly driven ICT courses in 2-3 Faculties. They have scheduled their course content from very basic to advanced. Other than this common situation, it was possible to find some specific programs conducted at department levels. A male young ICT coordinating lecturer (40 years old) with a PhD from the University of Sri Jayewardenepura endorsed that:

“We have implemented a program called computer practices (using key board to practice typing) for first year students at our Department level to enhance the ICT skills of poor skilled students. Since it is an optional, students gradually give up attending as they are tight with the content of their normal degree course. We have further introduced subject specific software which I used for my higher degrees in abroad and students are mandated to use them in order to make them smart with ICT use at their places of



employment. For example, research students should use LATEX software to arrange their thesis and we provide the basic introduction for the software.”

The Librarian interviewed also reiterated that other than preliminary courses, introductory courses and preliminary laboratory courses conducted as compulsory courses, they further facilitate digital literacy courses to train the students to work under digital environments.

A different aspect of implementation has been carried out in a particular Faculty in a selected university. A 37 year aged male ICT coordinating lecturer with Masters level qualification stated that:

“Other than the fundamental ICT courses, almost all the subjects in the Faculty are connected with ICTs. For example Accounting as Computer based accounting, Marketing as Digital marketing, ERP-Enterprise Resource Planning etc. Then all the students have to use them, whether they like or not to be skilled with ICTs. “

Moreover, the majority of the ICT coordinating lecturers concurred that they always plan to initiate new ICT related course units for students and that some of them have already implemented such programs.

All the ICT instructors in selected universities also agreed with what the coordinators mentioned. Moreover, they stated that other than common introductory ICT courses students are facilitated with practical classes on subject specific ICTs.

The responding lecturers and the ICT instructors were questioned about the infrastructure facilities available in their Faculties and universities. Regular developments on ICT environment in universities have taken place, they agreed. Some of the Faculties own Wi-Fi zones and other remaining Faculties have also planned for them. According to their perceptions, students are facilitated with ample computer and Internet labs where they can work whenever they need. Majority of the Faculties have access for a variety of ICT tools and the ICT instructors agreed that timely planned repairing of computers and connections take place.

A lecturer who was the Dean cum ICT coordinator of an Arts Faculty and a Masters Degree holder aged 37 years captured all the perceptions given by others reiterating that:

“Although we knew the necessity of ICT skills for our graduates, resources were the main problem we had to face. Limited lab facilities and lack of qualified staff were the main problems. So the plans went wrong. Finally we could improve computer lab facilities within the Faculty and install new computers. Thereafter, we could introduce 5

certificate courses in JAVA, Web designing, Graphic design, MS Office, hardware and SQL too. They are very useful and the students who qualified with these courses have got good jobs. We conducted those using visiting lecturers. Further, subject based IT components have been included in the Faculty curricula. For example, Statistics-SPSS, History-Graphic design and Economics-e-views etc. Lecturers in the Faculty have been advised to communicate with students through e-mails in order to get them to practice to use e-mails for their personal and learning activities.”

Students’ agreement with their lecturers’ and instructors’ perceptions were examined at group discussions. All the groups agreed with their teachers regarding the compulsory and optional courses. However, the group of students who participated for the group discussion at the University of Ruhuna endorsed that:

“Although we are facilitated with the basic ICT courses and other subject related ICT courses, not all the students can equally catch up with them. One reason is the support given during the computer work is not satisfactory and therefore some of our friends give up the courses. In order that students expect to have more ICT courses very basically with a strong assistance and more facilities because with limited facilities we face problems specially in using communication technologies.”

Not only the group of students from University of Ruhuna, but students from other selected universities except South-Eastern University of Sri Lanka (SEUSL) also reiterated that they have not been allowed to use communicating ICT tools. The students of the SEUSL mentioned that they have Wi-Fi zones and therefore they can use their own mobile computing devices to trial a variety of ICT tools. However, the students who joined the discussion at the University of Sri Jayewardenepura cited that their lecturers always encourage them to get ICT skills.

The quality of ICT capabilities of fresh graduates was probed into at the employers’ end. Employers agreed that there has been an improvement of the percentage of ICT capable graduates within last 5 years. Some of the job market employers stated that fresh graduates are smart in using ICTs, which means that the universities have identified the necessity and are performing their job well. However, private sector employers claimed that the fresh graduates’ capabilities are not exactly matched with their requirements and one employer with 12 years working experience endorsed that:

“If graduates have gained ICT skills from their respective universities, then they are able to catch up with the rapidly changing ICT environments in working places. Therefore, we

prefer ICT skilled graduates. Since there are many graduates who are willing to get jobs, we always try recruiting well-skilled ones for our limited requirements.”

A different perception was endorsed by the Government sector employer who had 12 years experience in recruiting people who said that:

“Newly recruited graduates have to perform whatever the duties they are entrusted with in the places where they are positioned in addition to their subject skills gained from their universities. So, we wish to have at least word processing skills for graduates, but still there are some without that skill.”

Considering all the views pointed by university people, it could be highlighted that universities were making maximum efforts to build ICT literate graduates to be able to create a global demand for their products. They have turned to the enhancement of ICT facilities with more ICT oriented courses at Faculty levels and students are also immersed in this ICT environment in their Faculties at respective universities. Concurrently, employers are also striving to recruit mostly skilled graduates to be compatible with ICTs in this electronic era. Therefore, it is apparent that, individual acceptance would be the one and only reason not to meet the graduates’ ICT skills gained at universities and employers’ demands. Therefore the study would be able to contribute with suggestions.

### **5.3.2.3 Enthusiasm and the major reasons for using ICTs**

While the university community were asked about the students’ awareness or the enthusiasm on ICTs and identified reasons to use ICTs, job market employers were questioned about the graduates’ flexibility for their ICT environments.

Different perceptions were given by the interviewees from the university field regarding students’/ graduates’ enthusiasm and their experience regarding the reasons to use them. However, most of the ICT coordinating lecturers affirmed that the students are less motivated and that they do not seem to have understood the benefits that could be gained through ICTs. They further argued that:

“Students are always credit, certificate and marks oriented. They believe that they can receive better positions by only obtaining the certificate for ICT courses. Therefore, they wish to get certificates with less effort. So, lecturers have to always force students to use ICTs showing its benefits.”

The same view was also confirmed by most of ICT instructors in selected universities. They altogether agreed that:

“A poor participation of the students is experienced for the optional ICT courses. Even though some introductory ICT courses are compulsory, it could be seen that attendance is gradually decreasing for the classes. At the beginning they are much enthusiastic to use computers and to learn new things, but later they limit themselves to their compulsory applications of the related course units which are assigned by lecturers.”

A 48-year old male computer instructor who had 20 years’ experience and qualified with a Masters’ Degree endorsed that:

“It seems that students are not much enthusiastic on ICTs and this may be considered as a privilege by Arts students. Poor attendance is higher for male students than female students in the Arts stream. But, I don’t know whether they practice using their own methods or devices.”

A forty two year-old lecturer with 10 years working experience and holding a PhD Degree who was interviewed from the Faculty of Management in the University of Colombo further elaborated the views of others:

“Students are smart now. But, most of them have not really identified the necessity of ICTs for the job market. Though they behave blindly regarding ICTs during the first two years in the university, they need ICT skills to continue their studies in their third year. That is a technique we use to direct them towards using ICTs. “

A different perception was presented by three ICT coordinating lecturers from Sri Jayewardenepura and South-Eastern universities. One mentioned that though the present students are more knowledgeable than earlier students, they are less motivated for learning new applications other than traditional and highly required ICT applications. Another lecturer from the University of Sri Jayewardenepura who is a 37-year old male with 10 years’ experience in the university and holding a Masters level qualification also endorsed that:

“Students are much more enthusiastic on ICTs. They prefer IT practical than theoretical classes having understood the relative advantages that could be drawn from ICT than manual processes. It seems that they further like to work with their batch mates together. However, these ICT applications are compulsory for their subjects and sometimes that may be the reason to use ICTs.”

The other lecturer who brought forward a totally different perception was a 28-year old female with 4 years’ experience in the university with a Masters’ Degree who stated that:

“I think that all the students have identified the requirement in our Faculty. We conduct ICT classes on weekends. Students enthusiastically participate in them too. I personally experienced that they always question to clarify their doubts about the lesson and other new applications.”

Then the students were questioned about their views regarding ICT usage. All groups of the students in selected universities agreed that:

“We have really understood the chance we can get at the job market with ICT certificates and skills. Our seniors have already got that chance too. Also, our lecturers always believe that we should use ICTs and they encourage us at all times. We have computer and Internet facilities too. But the problem is that when the course activities of our degree programs become tight; we do not have the time to allocate for extra things of ICTs. Then we are only limited to our subject applications of ICTs. Therefore, we suggest changing our curricula towards ICT oriented programs.”

Majority of the students further claimed that they have clearly experienced the efficiency and effectiveness that could be gained by using ICTs than their manual practices. It seems that they have become inclined to their traditional systems with rigid time frames. However, some students raised the issues of receiving minor support at computer labs, limited facilities and use of limited applications as problems in using ICTs at universities.

Fresh graduates' flexibility towards their job environments were inquired from the employers and all the employers in the private sector claimed that fresh graduates selected are interested in working in ICT oriented milieus. Moreover, they affirmed that it is not needed to train selected graduates for their specific ICT environments, because the graduates' are confident in their ICT skills. However, they mentioned that this may be because they select the spirit from the graduates' pool.

Conversely, the Government sector Director/Recruitment who had 12 years' experience said that:

“Even though we consider ICT knowledge as an additional qualification in recruiting graduates, a very few of them are trying to do something using their ICT knowledge gained at universities. But, most of the time they are not allowed to be smart with ICTs under the government sector regulations.”

The rationale of the theme was to determine whether the determinants identified in the literature are relevant for present ICT use and acceptance environment in Sri Lankan universities.

According to the perceptions of ICT coordinating lecturers, ICT instructors and students, it was clear that most of the time students are compelled to use ICTs since they receive benefits using ICTs and since their teachers think that they should use ICTs for their future. These are the two determinants identified from the literature review; performance expectancy which is the degree to which an individual student believes that using ICTs will help him or her to attain gains in performance and social influence which is the degree to which an individual student perceives that other important persons believe he or she should use ICTs.

According to the views of a majority of students, ease of using ICTs and the availability of more infrastructure facilities were the other two determinants identified. Those determinants were the effort expectancy: the degree of ease associated with the use of ICTs and the facilitating conditions: the degree to which an individual student believes that an institutional and technical infrastructure exists to support use of ICTs. Therefore, it is obvious that the key determinants identified in the literature review are well suited to the current pattern of using ICTs in universities.

#### **5.3.2.4 Differences among undergraduates/ graduates in their levels of performance of ICTs**

Not all students/graduates behave in the same manner when using ICTs. This aspect was inquired from the university community and the job market employers in order to ascertain whether the moderating factors identified from the literature are relevant for the current levels of using ICTs by the students/ graduates.

An interesting feature of the perceptions was that though all the interviewees have experienced individual differences in the performance on ICTs of the students/ graduates, exact reasons could not be identified by all of them. They believe that happens because of the students'/ graduates' attitudes and the self-efficacy towards the work/job and ICTs. Attitude, self-efficacy and anxiety were indirect determinants identified by the theoretical base selected for the current study.

Most of the interviewees identified the existence of the digital divide among students/ graduates. Most of the university people have identified that this gap declines throughout the time in the university and that it vanishes when they leave the university. Students also entirely agreed with this perception and further clarified that:

“Most of our colleagues from rural areas make efforts to remove the gap and mostly achieve this when almost one year has elapsed. But, some of our friends they absolutely give up using ICTs.”

However, one ICT coordinator, a female lecturer from the SEUSL endorsed that:

“There is a big variation among students in their ICT performance. One of them is the difference between the students from metropolitan areas and rural areas. This gap continuously exists.”

She was 28-year old lecturer with a Masters Degree having only 4 years’ experience in the university service. Sometimes, her lower experience in university service may have caused to her to give a different perception than other senior people. However, that view could not be totally discarded due to a perception made by one Human Resource Manager, who was a 38-year old male with 12 years’ experience in employment who said that:

“We normally prefer to recruit persons who have done their education in metropolitan areas because they are always stylish in English and are keeping up with ICTs.”

It seems that the digital divide may continue for a little time after the graduation too.

Moreover, the university community has identified that the students who had ICT experience at their schools or through extra courses they followed before entering the university have performed well in using ICTs. This was confirmed by the focus group discussion held at the University of Ruhuna. All the students agreed that:

“Some of our students show best performance using ICTs since they have prior knowledge and experience with ICTs. We believe that prior experience is essential to successfully complete the computer courses in the university.”

Further, the university community claimed that the students who are facilitated with their own computers and Internet connections are more skillful than others. One of the ICT coordinating lecturers with more than 10 years experience in the university from the Arts Faculty of the University of Sri Jayewardenepura reiterated that:

“There is a big variation among students in ICT performance. Students, who were familiar with ICTs in their schools or in private courses, perform well. On the other hand, most of the students do not know even how to use a keyboard at the beginning, but finally they do programming too.”

Some of the lecturers and ICT instructors stated that they have experienced a gender difference in using ICTs. They affirmed that male students are more skillful than females. Moreover, some of the employers revealed that most of the time fresh graduates differ in ICT performance

according to the subject stream followed at universities and according to the university they graduated from.

Suggestions proposed by the interviewees disclose the existence of more factors which predict the ICT use and acceptance other than the main determinants identified. Those were the community to which students belong, their ICT experience and facilities available, gender, subject streams and the university. All these factors were considered for the current study and gender, ICT experience and Faculty were included as the moderating factors of the proposed model. In addition, the cultural factors were also included for the model as moderating factors in order to determine the individual differences among the students as experienced by the interviewees. Therefore, it is apparent that the proposed model has lent itself as relevant for the presently available ICT environments at universities.

#### **5.3.2.5 Strategies to promote ICT use of students**

In order to identify the attributes that could be used to make full use of ICTs by university students, the interviewees were asked to recommend strategies to promote ICT use and acceptance at universities. A variety of views was put forward by the university community and the employers in the leading fields. In a nutshell, while ICT lecturers and instructors are looking for expedients to promote using ICTs in universities; the job market employers are willing to have more ICT skilled graduates for their work places.

A common perception of all the ICT coordinating lecturers was to enhance the ICT infrastructure facilities in their Faculties. Those who do not have Wi-Fi zones have planned to implement more computer lab facilities with unlimited Internet connections. At the same time the lecturers have already taken action to commence more ICT courses such as credit based courses, entire ICT degree programs and ICT-oriented course units too.

Moreover, some had big plans beyond these. A Dean cum ICT coordinator of the Faculty who had 14 years' working experience with a Masters' level qualification said that:

“Concurrently we have planned to provide laptops for students and to improve the infrastructure facilities within the Faculty with a Wi-Fi zone. Also, we have already made arrangements to initiate a credit based compulsory ICT course for our students from next year.”

Another young male lecturer with 10 years' experience in the University of Sri Jayewardenepura endorsed that:



“Our vision is towards a paperless scenario in the Faculty. Traditional methods will be replaced by electronic. For example digital notice boards (currently implemented) and digital publications too. Also, we wish to improve facilities and other subject-based improvements.”

Another different plan was revealed by a male ICT coordinating lecturer from the University of Colombo. He was a PhD qualified senior lecturer with 10 years’ ICT experience and he declared that;

“Online computer based assignments will be employed. Arrangements have already been made to repair computers by the students themselves by providing necessary knowledge and skills to them.”

Majority of the ICT coordinating lecturers have identified the lack of qualified staff in their Faculties as a barrier to making students more skilled in ICTs. They have already made plans to train their existing staff members and to extend recruiting more skillful lecturers. However, one of the ICT coordinating lecturers who is a professor with a PhD Degree and 52-year-old mentioned that:

“I do not plan to make more facilities and courses in the Faculty, because the existing resources have not been fully utilized by the present students. Therefore, I wish to use other strategies to promote using ICTs among the students in the Faculty.”

A majority of the ICT instructors have experienced that most of the students do not get the maximum benefits of the resources available in Faculties and they suggest that lecturers should form strategic plans to force students to make full use of ICTs. Students also expect such a situation in their Faculties. Groups of the students with whom discussions were made agreed that:

“If we can use ICTs along with our course units of the degree programs or as a compulsory part of the subjects we learn, then we will be able to use them to the level our lecturers expect with our rigid schedules.”

Moreover, the majority of the students wish to have ICT courses which are very basic to advanced with an enormous support at the practical classes. Some were willing to have more computer and Internet facilities to be able to use them whenever they need.

A variety of perceptions were given by the employers. Most commonly they had experienced that even though the students were knowledgeable in using ICTs they are reluctant to use their knowledge at their work places. Some private sector employers claimed that they prefer if fresh

graduates would be able to use communication technologies such as Skype, Facebook and e-mail. Finally, a novel view emerged through the perceptions of employers. They believe that the students can build up a self-demand at the job market by improving their individual use of ICTs during the undergraduate period.

According to the perceptions given by the interviewees, it emerged that complete utilization of ICTs has not taken place by the university students. Therefore, it is clear that there exists a gap between the input and output with respect to ICTs and the current study is feasible and relevant for the prevailing situation. Exploring the individual use and acceptance of ICTs will be critical to fill the gap.

### **5.3.3 Commonly important ICT tools for graduates**

The interviewees were then provided with a list of ICT tools identified through the literature review to rank them according to importance in order to determine the mostly important ICT tools for all graduates in common. The scale of 1 to 5 where 1 is very unimportant and 5 is very important was used to gauge the importance of each item that participants think a graduate should be equipped with. The descriptive statistics of each ICT tool is summarized in Table 5.2.

According to Table 5.2, the higher means ( $>4$ ) and the value that occurs most often (modes =5) belong to Word processing, Spreadsheets, Presentation, E-mail, Internet search engines and online applications (banking, bill paying etc.) indicating that the majority of the respondents ranked those tools as very important for fresh graduates. Statistical significance of the mean differences was tested employing the Friedman test. The Chi-square value was 242.939 and the p-value was 0.000 ( $<0.05$ ) verifying that the identified mean differences are significant. The highest mean ranks of the Friedman test were for Word processing, Spreadsheets, Presentation, E-mail, Internet search engines and online applications (banking, bill paying etc.).

Results revealed that without a significant difference between the groups 'university community' and the 'employers', the majority of the respondents believe that fresh graduates should be equipped with at least Word processing, Spreadsheets, Presentation, E-mail, Internet search engines and online applications (banking, bill paying etc.) skills in common.

**Table 5.2****Descriptive statistics of commonly important ICT tools**

Commonly important ICT tool	Minimum	Maximum	Mean	Mode	Std. Deviation
Word processing (MS Word)	5	5	<b>5.00</b>	<b>5</b>	.000
Spreadsheets (MS Excel)	3	5	<b>4.82</b>	<b>5</b>	.588
Presentation (MS Power Point)	4	5	<b>4.77</b>	<b>5</b>	.429
Specific software (Subject specific s/w packages/ SPSS)	2	5	3.64	4	1.002
E-mail (Gmail)	3	5	<b>4.64</b>	<b>5</b>	.727
Virtual learning environments (Content/Learning Management Systems, Moodle)	1	5	3.50	3	1.185
Internet search engines (Yahoo)	2	5	<b>4.45</b>	<b>5</b>	1.057
Journal databases, catalogues (Emerald, OPACs)	1	5	2.95	3	1.090
Wikis (Wikipedia)	2	5	3.41	3	.959
Social networks (FaceBook)	2	5	3.55	3	.963
Media sharing (You tube)	2	5	3.45	3	1.011
Blogs (Wordpress)	2	5	3.23	3	.813
Participatory media or group ware (Forums/ Bulletin board systems, Quora)	2	5	3.55	3	.963
Instant messaging/Video conferencing (Skype)	2	5	3.45	3	1.011
Programming (JAVA)	1	5	2.23	1	1.193
Web designing (Joomla)	1	5	3.27	3	1.241
Music, drawing	1	5	2.50	2	1.185
Games	1	5	1.82	2	.958
E-newspapers	1	5	2.55	2	.963
Online banking, bill paying	2	5	<b>4.09</b>	<b>5</b>	1.065

Source: Calculations by the author

**5.4 SUMMARY**

This chapter analyzed the feasibility of the proposed study. It covered the present situation regarding ICTs in universities and the job market, identifying the determinants of ICT use and essential ICT tools which a fresh graduate basically has to be able to use. Semi structured interviews and focus group discussions were conducted at the four selected universities and various other fields in Sri Lanka.

Perceptions of the interviewees revealed that the basic ICT is an essential component for today's job market and that employers believe that a graduate can easily capture the demand by him/herself for their position with advanced ICT skills. Universities were making efforts to make graduates ICT literate and a majority of the students have identified the necessity of ICTs for the job market demand. These facts support the feasibility of the current study. It was found that a majority of the respondents believe that fresh graduates should be equipped with at least Word processing, Spreadsheets, Presentation, E-mail, Internet search engines and online applications (banking, bill paying etc.) skills in common.

Results further revealed that the key determinants identified in the literature review are well suited to the current pattern of using ICTs in Sri Lankan universities. Further, the interviewees disclosed the existence of more factors which predict ICT use and acceptance other than the main determinants identified. Hence, the moderating factors were also matched with the proposed factors and it revealed the proposed model has lent itself as relevant for the presently available ICT environments at universities.

Finally, it was revealed that the complete utilization of ICTs has not taken place at universities by the students and that therefore there exists a gap between the input and output with respect to ICTs and the current study is still feasible for the prevailing situation.

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## **MAIN STUDY-PRELIMINARY DATA ANALYSIS AND FINDINGS**

### **6.1 INTRODUCTION**

Chapter Five analyzed the exploratory part of the study which showed that the study was feasible in the present Sri Lankan context. It also evaluated the determinants on ICT use and most important ICT tools for undergraduates and how skills in using these tools are necessary for the job market. This chapter presents the preliminary data analysis of the main study. The reliability and the validity of data were measured by testing the Cronbach's alpha together with inter-item correlation and convergent validity of the constructs. The descriptive analysis of responses and respondents, cultural aspects of the sample, background of ICT use and their relationships with demographic factors, types of ICT tools used by the students and the intention to use, extent to which students use ICTs, how to motivate them to make full use of ICTs and significant differences of ICT use behavior according to demographic factors were achieved using descriptive statistical techniques and Chi-square test. Further the additional comments on current use and future acceptance of ICTs were also analyzed. Therefore, the results of this preliminary data analysis would fulfill the following four objectives of the study;

1. To assess what types of ICTs are used by university students in Sri Lanka
2. To assess the extent to which Sri Lankan university students use and intend to use ICTs
3. To identify socio-demographic factors that may influence ICT use and acceptance by university students.
4. To investigate how university students are motivated to improve the use of ICTs

### **6.2 RELIABILITY AND VALIDITY ANALYSIS**

Internal consistency reliabilities measured based on Cronbach's alphas were considered to be good (greater than 0.80) and only a few were acceptable (in 0.7 range) as presented in Table 6.1. Quite high values of reliability indicate that the items in each set (concept) are positively correlated with one another which mean that the questionnaire items in each independent variable show accuracy in measurement in the main survey.

**Table 6.1****Results of the reliability and validity tests**

<b>Variable</b>	<b>No. of items</b>	<b>Cronbach's alpha</b>	<b>Inter-item correlation</b>	<b>Item-total correlation</b>
Use behavior (ICT tools)	20	0.896	0.156-0.549	0.382-0.656
Use behavior (purposes)	5	0.812	0.294-0.576	0.376-0.696
Performance Expectancy	4	0.843	0.461-0.568	0.611-0.744
Effort expectancy	4	0.729	0.264-0.417	0.439-0.593
Social influence	3	0.800	0.483-0.569	0.577-0.712
Facilitating conditions	4	0.775	0.358-0.474	0.513-0.673
Behavior intention (ICT tools)	3	0.862	0.610-0.681	0.692-0.790
Behavior intention (purposes)	5	0.812	0.289-0.550	0.463-0.702
Motivations to full use of ICTs	5	0.827	0.385-0.574	0.527-0.683
Masculinity/Femininity	5	0.775	0.329-0.579	0.447-0.676
Individualism/Collectivism	5	0.789	0.217-0.418	0.426-0.673
Power distance	7	0.863	0.382-0.686	0.538-0.710
Uncertainty Avoidance	6	0.722	0.046-0.549	0.096-0.571

Source: Calculations by the author

The degree to which two items of the same concept are correlated is assessed by the convergent validity. As Robinson, Shaver, & Wrightsman (1991) recommended the inter-item correlation values should exceed 0.30 and the item-to-total correlations that exceed 0.50 have a better validity of the instrument. Almost all of the inter-item correlation values indicated in Table 6.1 exceed 0.30, with only some of them being less than 0.30 and the item-to-total correlations exceed 0.50 except for a few. These results signify the convergent validity of the questionnaire of the main survey.

### **6.3 PROFILE OF THE RESPONSES**

A total number of 2331 questionnaires were distributed among the sample selected from four universities. Out of those who responded, 1682 questionnaires could be used for the analysis with a 72.16% response rate. The response rate (72.16%) was satisfactory, since the reliability to perform statistical tests had been achieved.

The profile of the responses based on the university, common subject stream and the year of study is depicted in Table 6.2.

As shown in Table 6.2, the 1682 valid responses comprised 32.9% from the University of Colombo, 30.4% from the University of Sri Jayewardenepura, 15.5% from the University of Ruhuna and 21.2% from the South-Eastern University of Sri Lanka.

**Table 6.2****Profile of the questionnaire responses**

<b>Variable</b>		<b>Percentage (count)</b>
University	Colombo	32.9% (554)
	Sri Jayewardenepura	30.4% (511)
	Ruhuna	15.5% (261)
	South Eastern	21.2% (356)
Common subject stream	Arts	32.6% (548)
	Science	27% (454)
	Management	40.4% (680)
Study year	First year	55.2% (929)
	Third year	44.8% (753)
Degree	General	43.8% (737)
	Special	56.2% (945)

Source: Calculations by the author

The majority of the responses were from the University of Colombo (32.9%), even though the University of Sri Jayewardenepura had the largest population size (see Table 4.4). The lowest percentage of the responses was from the University of Ruhuna. That was because when the researcher visited the university, the Faculty related to the Arts subject stream had been closed. The majority of the responses (40.4%) was from the Management subject stream and the lowest percentage was from the Science subject stream (27%). This may be because the number of students in the Science subject stream is lower than in the Arts and the Management subject streams. 55.2% was from the first year students and 44.8% responses were from the third year students. The profile of responses further consisted of a majority of (56.2%) special Degree students and 44.8% general degree students.

#### **6.4 SOCIO-DEMOGRAPHIC BACKGROUND OF THE RESPONDENTS**

The socio-demographic background of the respondent sample which responded to ICT use and acceptance was explored in order to get an insight into the composition of the respondents for the current study. The socio-demographic characteristics of university students in selected four universities are summarized in Table 6.3.

As shown in Table 6.3, 2/3 of university students who responded to the survey were female. Majority of the respondents (97.2%) were from the 20-25 age group. Most of the students were Sinhala (81%) Buddhists (78.1%) and were from rural areas (60%).

**Table 6.3****Socio-demographic characteristics of the respondents**

<b>Characteristics</b>	<b>Group</b>	<b>Percentage (Count)</b>
Gender	Male	25.9% (435)
	Female	74.1% (1247)
Age group	Below20	1.2% (20)
	20-25	97.2% (1635)
	Above 25	1.6% (27)
Ethnicity	Sinhala	81.0% (1365)
	Tamil	6.2% (105)
	Muslim	12.7% (213)
	Other	0.1% (1)
Religion	Buddhist	78.1% (1313)
	Hindu	5.2% (87)
	Islamic	13.0% (219)
	Christian	3.7% (63)
Community	Urban	40.0% (672)
	Rural	60% (1010)

Source: Calculations by the author

### **6.5 INDIVIDUAL CULTURAL VALUES**

Four cultural dimensions drawn from the Hofstede's study (1997) were investigated in the current study. These consisted of masculinity/ femininity (5 items target masculine cultural values), individualism/collectivism (5 items target collectivism cultural values), power distance (7 items target high espoused power distance cultural values) and uncertainty avoidance (6 items target high espoused uncertainty avoidance) (see questionnaire items in *Appendix VI*). The scale used to measure these 23 items was; "0= Strongly Disagree 1= Disagree 2= Neutral 3= Agree 4= Strongly Agree". The grand means of these factors for the sample are shown in Table 6.4.

Majority of the respondents' individual cultural values about masculinity/ femininity moved a little bit towards femininity cultural thoughts (mean =1.88). Most of the respondents indicated a low power distance cultural aspects (mean=1.70) as shown in Table 6.4. Further the table indicated a higher espoused collectivism (mean=2.8) cultural thoughts and high espoused uncertainty avoidance (mean=2.69) cultural values (see *Appendix XI*).



**Table 6.4****Means of the cultural factors**

<b>Cultural factor</b>	<b>Mean</b>	<b>Scale</b>
Masculinity/Femininity	1.8842	Femininity → Masculinity 0 -----2.5----- 4
Individualism/Collectivism	<b>2.7969</b>	Collectivism → Individualism 0 -----2.5----- 4
Power Distance	1.7073	Low → High 0----2.5---- 4
Uncertainty Avoidance	<b>2.6915</b>	Low → High 0----2.5---- 4

Source: Calculations by the author

## 6.6 BACKGROUND OF ICT USE OF THE RESPONDENTS

Background of the ICT use was investigated under two aspects; before entering the university and after entering the university. A substantial percentage of students (68.4%) had followed ICT courses before entering the university. Majority (85.4%) of them had carried out desktop application courses and 40.3% of them have followed WWW and the Internet related courses. Operating systems and computer programming courses had been followed by 34.2% and 16.3% respectively.

Although almost all the universities conduct ICT courses for freshmen, the highest percentage of students (57.4%) claimed that they have not followed ICT courses after entering the university. Having optional courses may be a reason for this result. 42.6% of students stated that they had followed ICT related courses at the university and the majority of them (20.6%) had followed the introductory courses.

Table 6.5 summarized the background information about personal ICT use. It presents the information on number of years in using ICTs (ICT experience), students' self-assessment about their ICT skill level, availability of computer and the Internet facilities whenever necessary and the facilities used to access ICTs. As shown in the Table, a considerable percentage of students (46.8%) had 1-5 years' experience in using ICTs and 32.3% had less than 1 year experience using ICTs.

Majority of the students (78.5%) self-reported their skill level of using ICTs as 'moderate'. Further the Table 6.5 depicts that the highest percentage of respondents had a computer (86.2%) and Internet (76.4%) facilities whenever necessary and most of them have used their own mobile devices such as laptops, note pads and mobile phones to access ICTs. Majority of the

respondents (49.3%) used mobile devices to access ICTs and a considerable percentage (28.4%) used their mobile phones to access ICTs.

**Table 6.5****Background information of personal ICT use**

Characteristics	Group	Percentage (Count)
ICT Experience	Less than 1 year	32.3% (544)
	1-5 years	46.8% (787)
	6-10 years	14.7% (247)
	More than 10 years	6.2% (104)
ICT Skills	Poor	18.4% (309)
	Moderate	78.5% (1321)
	High	3.1% (52)
Computer facilities	No	13.8% (232)
	Yes	86.2% (1450)
Internet facility	No	23.6% (397)
	Yes	76.4% (1285)
Facilities used to access ICTs	University facilities	42.6% (712)
	Home-Office-Internet Cafe	6.0% (100)
	Own mobile device	72.5% (1212)
Mostly used device	Desktop computers	22.2% (373)
	Mobile phones	28.4% (478)
	Other mobile devices	49.3% (830)

Source: Calculations by the author

**6.6.1 Differences in the background of ICT use according to demographic factors**

Variables related to the background of ICT use were cross-tabulated to check their relationship with differences in demographic factors. The differences observed through percentages were further tested using Chi-square test for significance. The Chi-Square Test (goodness-of-fit test) compares the observed and expected frequencies in each category to test that all categories contain the same proportion of values.

As shown in Table 6.6, significant differences could be identified within the ICT experiences of the students under 0.05 significance level. Urban students have more than 5 years' ICT experience (29%) compared to only 15.5% of rural students. Third year students have higher ICT experience (more than 10 years) (73.6%) compared to only 62.8% of first year students. Also, Science students possess a higher ICT experience (more than 5 years) (34.1%) as compared to Arts and Management students. On the other hand, a majority of the Arts students (87.4%) have only 0-5 years ICT experience as compared to Science and Management students.

Table 6.6

## Distribution of the ICT experience with demographic factors

ICT experience		Percentage (count)				Chi-square test results
		Less than 1 year	1-5 years	6-10 years	More than 10 years	
Community	Urban	25.0% (168)	46.0% (309)	<b>19.8% (133)</b>	<b>9.2% (62)</b>	Chi-square=55.446 Sig.= 0.000
	Rural	37.2% (376)	47.3% (478)	11.3% (114)	4.2% (42)	
Year of study	First year	37.2% (346)	46.2% (429)	11.7% (109)	4.8% (45)	Chi-square=33.915 Sig.= 0.000
	Third year	26.3% (198)	<b>47.5% (358)</b>	<b>18.3% (138)</b>	<b>7.8% (59)</b>	
Common subject stream	Arts	<b>40.0% (219)</b>	<b>47.4% (260)</b>	9.9% (54)	2.7% (15)	Chi-square= 94.311 Sig.= 0.000
	Science	19.6% (89)	46.3% (210)	<b>22.9% (104)</b>	<b>11.2% (51)</b>	
	Management	34.7% (236)	46.6% (317)	13.1% (89)	5.6% (38)	

Source: Calculations by the author

Males have (5.7%) high ICT skills as compared to their female counterparts. While a majority of rural students (22.2%) have poor ICT skills, urban students have (87.4%) moderate and high ICT experience compared to rural students. Third year students (3.3%) have high ICT skills compared to only 2.9% of first year students (see Table 6.7).

Table 6.7

## Distribution of the ICT skills with demographic factors

ICT skills	Percentage (count)			Chi-square test results
	Poor	Moderate	High	
Male	23.4% (102)	70.8% (308)	<b>5.7 (25)%</b>	Chi-square= 26.085 Sig.= 0.000
Female	16.6% (207)	81.2% (1013)	2.2% (27)	
Urban	12.6% (85)	<b>83.2% (559)</b>	<b>4.2% (28)</b>	Chi-square=27.208 Sig.=0.000
Rural	<b>22.2% (224)</b>	75.4% (762)	2.4% (24)	
First year	22.4% (208)	74.7% (694)	2.9% (27)	Chi-square =22.355 Sig.= 0.000
Third year	13.4% (101)	83.3%(627)	<b>3.3% (25)</b>	

Source: Calculations by the author

## 6.7 TYPES OF ICT TOOLS USED BY THE STUDENTS AND INTENTION TO USE

For the current study, use of 20 different ICT tools which were derived from a comprehensive literature review conducted and presented in Chapter Three, were considered. Table 6.8 summarizes the frequency of using those different ICT tools by the university students.

**Table 6.8****Current frequency of use of different ICT tools by university students**

ICT Tool	Frequency of use (percentages)				
	Do not use at all (0)	Use about once every month (1)	Use about once every week (2)	Use about once a day (3)	Use several times a day (4)
Word processing	10.2% (171)	37.3% (628)	33.0% (555)	9.5% (159)	10.0% (169)
Spreadsheets	30.9% (519)	40.0% (673)	3.5% (59)	5.6% (94)	20.0% (337)
Presentation	17.2% (289)	46.0% (773)	24.9% (419)	7.1% (119)	4.9% (82)
Specific software	58.6% (985)	18.7% (314)	11.7% (196)	6.3% (106)	4.8% (81)
E-mail	13.6% (229)	17.2% (290)	26.1% (439)	22.2% (373)	20.9% (351)
Virtual learning	43.6% (733)	19.0% (319)	19.0% (319)	12.0% (201)	6.5% (110)
Internet searching	11.5% (194)	11.4% (191)	19.0% (320)	22.2% (374)	35.9% (603)
Journal databases	67.0% (1127)	18.1% (305)	8.1% (137)	4.4% (74)	2.3% (39)
Reference/ libraries	20.9% (352)	21.3% (358)	24.6% (414)	16.1% (270)	17.1% (288)
Social networks	24.9% (418)	9.2% (154)	14.6% (246)	18.2% (306)	33.2% (558)
Media sharing	20.9% (351)	19.3% (325)	22.2% (373)	17.5% (295)	20.1% (338)
Blogs	62.0% (1043)	15.5% (261)	11.5% (193)	6.1% (102)	4.9% (83)
Participatory media	77.1% (1297)	11.6% (195)	6.2% (104)	2.9% (49)	2.2% (37)
Instant messaging	46.7% (785)	21.8% (366)	13.9% (234)	10.2% (172)	7.4% (125)
Programming	72.9% (1226)	13.1% (221)	8.0% (135)	3.4% (57)	2.6% (43)
Web designing	80.3% (1350)	10.2% (172)	5.3% (89)	2.9% (48)	1.4% (23)
Music, Drawing	24.0% (404)	19.8% (333)	21.2% (357)	15.8% (266)	19.1% (322)
Games	26.3% (442)	21.3% (358)	22.1% (371)	14.3% (241)	16.1% (270)
E-news papers	38.0% (640)	21.6% (364)	18.8% (316)	12.0% (202)	9.5% (160)
Online banking	73.2% (1232)	15.2% (256)	6.5% (110)	2.8% (47)	2.2% (37)

Source: Calculations by the author

According to Table 6.8, Internet searching is the tool which has the greatest frequency of use (“use several times a day”) by the majority of the students (35.9%). Most of the respondents used Microsoft Office packages, word processing, spreadsheets and presentation packages about once a month. The related percentages were 37.3%, 40.0% and 46.0% respectively. Even though the lecturers and the job market people believe that e-mail is a tool, which fresh graduates should be equipped with, a majority of the respondents used e-mail (26.1%) only about once a week. 22.2% used e-mail once a day and 20.9% used e-mail several times a day. Further, the highest

percentage of students (33.2%) use social networks like face book around several times a day. Therefore, the results reveal that the majority of the students more commonly used word processing, spreadsheets, presentation packages and the Internet searching as educational ICTs and e-mail and the social network sites have been mostly used as the communication ICT tools.

As highlighted in Table 6.8, the majority of the students do not use Specific software, Virtual learning environments, Journal databases, Blogs, Participatory media, Online banking, Computer Programming, Web designing, Music/ Drawing, Games, E-newspapers papers and Instant messaging at all. Therefore, it is apparent that the technical use of ICT and other uses of ICTs such as for entertainment seemed to be lower.

Students' intention for future use of the different ICT tools was summarized in Table 6.9.

**Table 6.9**

**Frequency (means and modes) of intention to use of ICT tools**

<b>Group</b>	<b>Intention (mean)</b>	<b>Intention (mode)</b>
I intend to increase the frequency of using ICT tools which have been used by me.	2.91	3
I intend to use ICT tools which have not been used by me and/or new ICT tools which I have not used yet.	2.95	3
I intend to increase the frequency of using new ICT tools.	2.93	3

Source: Calculations by the author

According to the means as well as the value that occurs most often (mode) presented in Table 6.9, students intend to use ICT tools which they currently use, more frequently (“use about once a day=3”) (mean=2.91 and mode=3) in the future. The students agreed (mean=2.95≈3 and mode=3) to use the participatory media, computer programming, web designing and online banking etc. which were not used at all by the majority. Further, the students intend to increase the frequency of using those new ICT tools “about once a day” (mean 2.93 and mode=3) on average.

## **6.8 EXTENT TO WHICH STUDENTS' USE AND INTENTION TO USE ICTS FOR VARIOUS PURPOSES**

Current use behavior of ICTs under four different purposes and the intention to use them were assessed using their self-reported scale. This was analyzed on an average basis and as percentages.

### 6.8.1 Use behavior of ICTs for various purposes and intention to use on average

Students reported that they currently use ICTs “about once every week” (means $\approx$ 2 and mode=2) for academic/educational purposes on average. Majority of the students has reported that they use ICTs “several times a day” (since mode=4) for social communication and other purposes. (see Table 6.10). The current average overall use of ICTs was also “about once every week” (mean=2.4 $\approx$ 2 and mode=2). Although the average of using ICTs for technical use “about once every month” (mean=0.92 $\approx$ 1), most of the students claimed that they “do not use at all” ICTs for technical purposes (mode=0). However, the students’ intention to use ICTs for all purposes is higher as depicted in Table 6.10. They wish to use ICTs for all purposes “about once a day” (means $\approx$ 3 and mode=3) on average.

**Table 6.10**

#### Frequency (means and modes) of use of ICTs for different purposes and intention to use

Purpose	Use		Intention	
	(Mean)	(Mode)	(Mean)	(Mode)
Academic and educational	2.43	2	3.23	3
Social communication	2.22	4	3.06	3
Technical use	.92	0	2.56	3
Other use	2.13	4	2.95	3
Overall use	2.40	2	2.90	3

Source: Calculations by the author

### 6.8.2 Use behavior of ICTs for various purposes and intention to use

The frequencies of using ICTs for the above specific purposes and the overall use frequency of ICTs were summarized in Table 6.11.

**Table 6.11**

#### Current frequency of use of ICTs for different purposes

Purpose	Frequency of use (percentages)				
	Do not use at all (0)	Use about once every month (1)	Use about once every week (2)	Use about once a day (3)	Use several times a day (4)
Academic and educational use	7.6% (127)	16.3% (274)	27.8% (468)	22.8% (383)	25.6% (430)
Social communication use	14.9% (250)	18.4% (309)	21.3% (359)	20.3% (342)	25.1% (422)
Technical use	53.1% (893)	20.3% (341)	13.4% (226)	8.0% (134)	5.2% (88)
Other use	17.7% (298)	18.7% (314)	20.1% (338)	20.4% (343)	23.1% (389)
<b>Overall use</b>	7.6% (127)	14.9% (251)	29.0% (487)	27.6% (464)	21.0% (353)

Source: Calculations by the author

Table 6.11 highlights the highest percentages of using frequencies of each purpose and overall use. Results indicate that the majority of the respondents used ICTs “about once a week” for academic and educational purposes (27.8%). They have further used ICTs which had the greatest frequency, “several times a day” for communication purposes (25.1%) and other purposes such as entertainment (23.1%). The majority of the respondents have not used ICTs for technical purposes (53.1%) at all. However, the present overall use of ICTs by the majority of university students was confined to “about once every week” (29%).

### 6.8.3 Current use and intention to use of ICTs according to socio-demographic factors

The study attempted to find out whether there were any significant differences in the mean scores of current use behavior and the intention to use behavior of ICTs (10 items) according to socio-demographic factors. Four socio-demographic factors of students were examined. These factors included; Faculty (main subject stream), gender, age group and ICT experience. In order to examine these, the non-parametric Independent-k-sample test (Kruskal-Wallis test) was used without assuming the data to have come from a normal distribution. This tests the hypothesis to see whether there is a significant difference among groups. Summary of the significant results is presented in Table 6.12.

**Table 6.12**

#### Summary of the Kruskal-Wallis test results (no. of significantly different variables)

Variable	No of total items	Common subject stream	Gender	Age group	ICT experience
Current ICT usage behavior	5	5	3	1	4
Intention to use behavior	5	3	-	1	4

Source: Calculations by the author

#### 6.8.3.1 Common subject stream

All five items of the current use and three items of the intention to use of ICTs significantly differed according to the common subject stream of the students. ICT using frequency for academic purposes, social communication purposes, technical use, other use and finally the overall use of ICTs differed among the subject streams. Current use behavior of Science students was higher than those of Arts and Management students (see *Appendix XII*). Intention to use of ICTs for social communication use, technical use and other use significantly differed among the subject streams of the respondents. While Science students mostly intend to use ICTs for social communication activities and other uses such as entertainment, Arts students intend to use ICTs for technical purposes (see *Appendix XII*).

### 6.8.3.2 Gender

The significant differences in the mean scores of social communication use, technical use and other use of ICTs of male respondents were higher than those of female students (see *Appendix XII*).

### 6.8.3.3 Age

The Kruskal-Wallis test results indicated significant differences among age groups in current use of ICTs for social communication purposes and the intention to use for technical purposes in the future. Current use of ICTs for social communication activities was higher for older (above 25 years) students than for others. However, it was shown that the students from 20-25 age group intend to use ICT for technical purposes more than the other groups (see *Appendix XII*).

### 6.8.3.4 ICT experience

Current use behavior of ICTs for academic/ educational use, social communication use, other use overall use and intention to use ICTs for the same purposes significantly differed according to the ICT experience of the respondents. While academic/ educational use was higher for the students who have 6-10 years ICT experience, other three uses were higher for the more experienced (more than 10 years) students than others. The intention to use ICTs for academic/ educational, social communication, other use and the overall use were higher for the longer experienced (more than 10 years) students than those of others (see *Appendix XII*).

## 6.9 MOTIVATION TO MAKE FULL USE OF ICTS

Majority of students (43.1%) agreed that they still have not made full use of the ICTs, and therefore intended to use ICTs more in all types of work in the future (mean=3.03 and mode=3) (see *Appendix XII*). Percentages of the agreements of the motivation to make full use of ICTs are summarized in Table 6.13.

As highlighted in Table 6.13, a majority of the students agree that they are motivated to make full use of ICTs in the future. Secondly, a higher percentage of students strongly agreed with motivation. The suggested motives were:

1. Availability of persons to help when in difficulties
2. Having updated trainings/ workshops/ courses regularly
3. Availability of satisfactory facilities
4. Changes of curriculum to ICT orientation in the future
5. Need to initiate university policy to be an e-University in the future



**Table 6.13****Motivations to make full use of ICTs**

<b>Motivation</b>	<b>Percentage (count)</b>					<b>Mean</b>	<b>Mode</b>
	Strongly disagree (0)	Disagree (1)	Neutral (2)	Agree (3)	Strongly agree (4)		
If anybody is available to help me when I have difficulties	.7% (11)	2.8% (43)	15.9% (242)	44.7% (681)	35.9% (546)	3.12	3
If updated trainings/ workshops/ courses are available when necessary	1.2% (18)	3.8% (58)	21.7% (331)	42.9% (654)	30.3% (462)	2.97	3
If satisfactory facilities (e.g. satisfactory computer hardware and software, satisfactory communication network etc.) are available to support usage	1.1% (16)	2.2% (34)	18.7% (285)	46.0% (700)	32.0% (488)	3.06	3
If the curriculum is changed to be ICT oriented in the future	9% (13)	2.8% (43)	20.0% (304)	46.0% (700)	30.4% (463)	3.02	3
If the university policy is to be an e-University in the future	2.4% (37)	4.1% (62)	21.4% (326)	41.2% (628)	30.9% (470)	2.94	3

Source: Calculations by the author

### **6.9.1 Differences in motivation to make full use of ICTs by socio-demographic factors**

Three motives; having updated trainings/ workshops/ courses regularly, changes of curriculum to ICT orientation in the future and the university policy to be an e-university in the future significantly differed according to socio-demographic factors. Gender differences and subject stream differences were significant for those motivated for having updated trainings/ workshops/ courses regularly. Female subjects as well as Arts students have strongly claimed that they are motivated to make full use of ICTs if they have updated trainings/ workshops/ courses regularly on ICTs. Arts students, students in the 20-25 age group and students who have more than 10 years' experience in using ICTs have strongly claimed that they are motivated to make full use of ICTs if changes are taking place in the curriculum to be ICT oriented in the future. Students who possess more than 10 years' experience in using ICTs have declared that they would be motivated to make full use of ICTs if the university policy moves to be an e-University in the future (see *Appendix XII*).

### **6.10 COMMENTS ON ICT USE AND FUTURE ACCEPTANCE**

At the end of the main survey questionnaire an open ended question was asked to comment on the current ICT use and future acceptance. Various comments given by the students were then categorized into seven themes; necessity of more infrastructure facilities, additional knowledge

on ICTs, more assistance in using ICTs, necessity to have a higher use of ICTs, make ICT as a compulsory subject in the university, necessity to include ICT into the education system from the kindergarten and necessity of controlling bad effects in using ICTs. The percentages of students giving these comments were summarized in Table 6.14.

**Table 6.14****Frequency of comments on ICT use and acceptance**

<b>Comment</b>	<b>Percent of cases</b>
More facilities	<b>39.8%</b>
Knowledge on ICTs	<b>30.9%</b>
More assistance	19.9%
Higher usage of ICTs	<b>22.5%</b>
Compulsory course	11.0%
From kindergarten	20.4%
Bad effects	4.7%

Source: Calculations by the author

As shown in the Table 6.14, even though the universities regularly improve their ICT infrastructure at Faculty levels, the majority of the students (39.8%) mentioned that they need more facilities to use ICTs and for future acceptance. 30.9% have claimed that they need additional knowledge in using ICTs. However, 22.5% of the respondents have recognized that they should use ICTs at a higher level to successfully make a better demand at the job market.

### 6.11 SUMMARY

First, the assessment of reliability and validity analysis of the survey instrument confirmed that the instrument is reliable and valid. The response rate (72.16%) was satisfactory. The results associated with the description of the respondents' profile indicated that the majority of students were female (74.1%), aged in the range of 20-25 years (97.2%). Most of the respondents were Sinhala (81.0%), Buddhists (78.1%) and most have come from rural areas (60%). Regarding the background of ICT use the majority of students had 1-5 years' long experience (46.8%) and most self-reported that they possessed a moderate skill (78.5%) on ICTs. Majority of the students had computer facilities (86.2%) and internet facilities (76.4%) whenever they needed and most of them had used their own mobile devices (72.5%) to access ICTs.

The results related to the types of ICT tools used and the intention to use by students, revealed that the majority more commonly had used word processing, spreadsheets, presentation packages, the Internet searching, e-mail and the social network sites. Further, the students intend to use ICT tools which they currently use, more frequently ("use about once a day=3")

(mean=2.91 and mode=3) in the future. However, the students intended to increase the frequency of using new ICT tools “about once a day” (mean 2.93 and mode=3) on average.

Results indicate that the majority of the respondents used ICTs “about once a week” for academic and educational purposes (27.8%). They have further used ICTs “several times a day” for communication purposes (25.1%) and other purposes such as entertainment (23.1%). The majority of the respondents have not used ICTs for technical purposes (53.1%) at all. However, the present overall use of ICTs by the majority of university students was confined to “about once every week” (29%) and they intend to use ICTs for all purposes “about once a day” (means $\approx$ 3 and mode=3) on average. Further, the significant differences in the mean scores of current use behavior and intention to use behavior of ICTs with common subject stream, gender, age and the ICT experience could be identified.

However, the majority of students (43.1%) agreed that they still have not made full use of the ICTs, and therefore intended to use ICTs more in all types of work in the future (mean=3.03) and they suggested motivations; availability of helping persons for difficulties, having updated trainings/ workshops/ courses regularly, availability of satisfactory facilities, changes of curriculum to be ICT oriented in the future and the university policy to be moved towards an e-University in the future. Further, some of these motivations significantly differed according to the socio-demographic factors.

Also, the majority of the students (39.8%) commented that they need more facilities for current use of ICTs and future acceptance. Finally, 22.5% of the respondents have recognized that they should use ICTs at a higher level to successfully make a better demand at the job market. Further analysis using AMOS will be conducted to assess the relationship between determinants and current use behavior and behavior intention to use ICTs modeled in Chapter Three, the core of this research will be presented in Chapter Seven.

## CHAPTER 7

### MAIN STUDY-ICT USE AND ACCEPTANCE MODELLING

#### 7.1 INTRODUCTION

The profile of the responses and of the respondents together with what types of ICT tools and to what extent, to what purposes students used and intended to use ICTs were identified in Chapter Six. Factors that differ in the use and intention to use were also captured there. Determining the reasons behind the changes of use behavior and intention to use behavior will be discussed in this chapter. Also the chapter will examine the significant determinants that influence students' use behavior and intention to use behavior through the model constructed in Chapter Three. The proposed research model testing and the final formulation of the best model to the Sri Lankan context will be achieved at the end of this chapter. A variety of standard statistical techniques, such as reliability analysis, validity analysis, Structural Equation Modeling (SEM) and multi-group analysis were employed.

#### 7.2 CONSTRUCTS OF THE RESEARCH MODEL

The proposed research model consisted of six latent constructs as depicted in Table 7.1. It comprises of four exogenous and two endogenous constructs which were measured by one or more variables (items) through related questions identified in the literature. The exogenous constructs are latent, multi-item equivalent of independent variables and endogenous constructs are also latent, multi-item equivalents to dependent variables. These six constructs were measured by 15 items for exogenous constructs (independent variables) and 15 items for endogenous constructs (dependent variables) as presented in Table 7.1.

**Table 7.1**

**Constructs in the research model**

Construct	No. of items	Codes of constructs
*Performance expectancy (PE)	4	PE1-PE4
*Effort expectancy (EE)	4	EE1-EE4
*Social influence (SI)	3	SI1-SI3
*Facilitation conditions (FC)	4	FC1-FC4
**Use behavior of ICTs (UB)	5	UB1-UB5
**Intention to use behavior of ICTs (BI)	10	BIT1, BIT2, BIT3, BIS1, BIS2, BIS3, BIS4, BIS5, BI1, BI2
* = Exogenous Latent Construct    ** = Endogenous Latent Construct		

Source: Compilation by the author

Before proceeding with the statistical analysis for modeling, it is necessary to test the reliability and validity of the constructs. Reliability and validity should be separately considered but they are closely related conditions (Bollen, 1989). It means that the measures could be consistent (reliable) but not accurate (valid). On the other hand, measures could be accurate but not consistent.

### 7.3 RELIABILITY OF THE CONSTRUCTS

Consistency of the measurements is assessed using reliability measures. The internal consistency of a set of variables is measured using construct reliability. It explains the degree to which a set of variables specify the common latent construct. There are three reliability estimates that can be used; the Squared Multiple Correlations (SMC) for the observed variables, construct reliability and the variance extracted estimate (Bollen, 1989). For the current study, the SMC was used to measure the reliability of the constructs. The SMC should exceed 0.50 for a good observed variable and SMC of 0.30 signifies an acceptable indicator variable. Table 7.2 presents the SMC values for four exogenous latent constructs.

**Table 7.2**

#### SMC of 15 items of four exogenous latent constructs

Construct item	SMC estimate
<b>FC1</b>	<b>.361</b>
FC2	.574
FC3	.583
<b>FC4</b>	<b>.348</b>
<b>SI1</b>	<b>.460</b>
SI2	.695
SI3	.597
<b>EE1</b>	<b>.308</b>
<b>EE2</b>	<b>.453</b>
EE3	.568
<b>EE4</b>	<b>.514</b>
<b>PE1</b>	<b>.449</b>
PE2	.558
PE3	.722
PE4	.592

(see meanings of observed variables in the coding sheet in *Appendix VII*)

Source: Calculations by the author

Most of the SMC estimates of the 15 observed variables (indicators) of four exogenous latent constructs (PE, EE, SI and FC) exceeded 0.50 (see Table 7.2). Six items with less than 0.5 SMC estimates (highlighted in Table 7.2) were removed from the further analysis to improve the model fit to the data.

SMC estimates for two endogenous latent constructs were then extracted and the results were shown in Table 7.3. Most of the SMC estimates of the 15 observed items of the two endogenous latent constructs (UB and BI) exceeded 0.50 (see Table 7.3) except five highlighted in Table 7.3 will be deleted.

**Table 7.3**

**SMC of 15 items of two endogenous latent constructs**

<b>Construct item</b>	<b>SMC estimate</b>
<b>BIS1</b>	<b>.327</b>
<b>BIS2</b>	<b>.360</b>
<b>BIS3</b>	<b>.198</b>
BIS4	.527
BIS5	.597
BIT1	.621
BIT2	.548
BIT3	.662
BI1	.531
BI2	.533
<b>UB1</b>	<b>.470</b>
UB2	.630
<b>UB3</b>	<b>.165</b>
UB4	.572
UB5	.625

(see meanings of observed variables in the coding sheet in *Appendix VII*)

Source: Calculations by the author

#### **7.4 VALIDITY OF THE CONSTRUCTS**

Validity is the extent to which a measure is accurate. Discriminant validity measures the extent to which a construct is really distinct from other constructs. It assesses interrelation of the construct items. Higher correlations between latent construct items (greater than 0.80) propose a lack of discriminant validity because it presents multicollinearity (Holmes-Smith & Coote, 2006). Further, the pattern of coefficients and structure coefficients could be used to assess whether constructs in the measurement models are empirically discernible. Pattern coefficients

are the standardized factor loadings and the structure coefficients could be taken by the “all implied moments” in AMOS (Holmes-Smith & Coote, 2006).

The discriminant validity analysis was conducted separately for the exogenous and endogenous constructs because there should not be more than five constructs at a time (Holmes-Smith & Coote, 2006).

#### 7.4.1 Discriminant validity of exogenous constructs

First, the correlation matrix of items of the four exogenous latent constructs was extracted (see *Table 1 in Appendix XIII*). It did not show any higher correlations between latent construct items. Therefore, only six indicators (PE1, EE1, EE2, SI1, FC1 and FC4) which were identified in the reliability analysis were deleted and nine indicators were retained for further analysis.

Secondly, the standardized residual covariance between two indicators was investigated, whether they are less than absolute 2 in value. Most of the standardized residuals should have an absolute value less than 2 for a better model. There was not a single pair of indicators that presented a standardized residual covariance exceeding 2 in absolute value (see *Table 2 in Appendix XIII*). Therefore the same nine indicators were still retained for discriminant validity analysis. Variables were then modeled to examine discriminant validity of the constructs and *Figure 7.1* presents the resultant model and *Table 7.4* presents the correlations between latent constructs.

**Table 7.4**

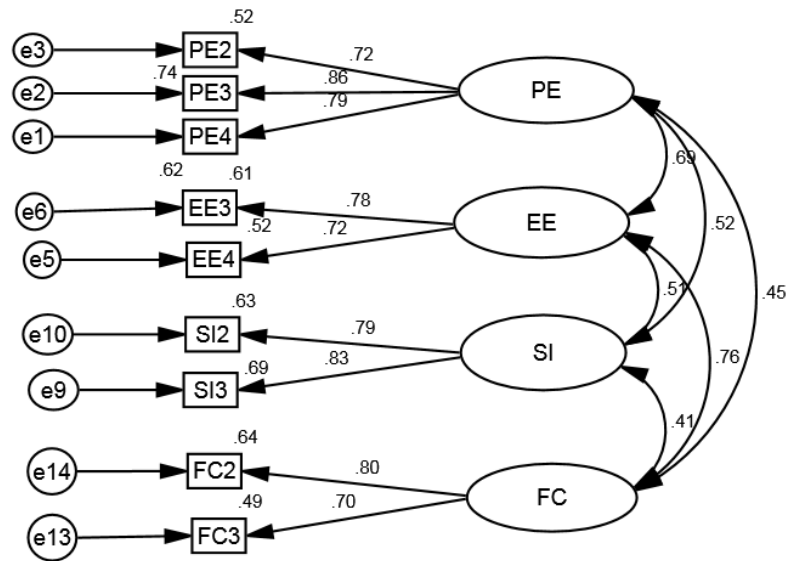
#### Correlations of four exogenous latent constructs

	Estimate of correlation
PE <--> EE	.690
PE <--> SI	.519
PE <--> FC	.450
EE <--> SI	.514
EE <--> FC	.764
SI <--> FC	.412

Source: Calculations by the author

The correlations between latent constructs were not higher than 0.8, which means that the four latent constructs in the research model were different to each other. The maximum correlation was shown between EE and FC, was 0.764. The model yields a  $\chi^2$  (Chi-square) value as 61.8, degree of freedom = 55 and p-value = 0.000. Other fit measures also indicate the goodness of fit

of the model to the data (CMIN/DF = 2.943, RMSEA = 0.035, TLI = 0.987, CFI = 0.992, NFI = 0.989, GFI = 0.991, AGFI = 0.981) (see Table 4.6 in p. 91 for the reference of fit measures).



Standardized Estimates,  
Chi-square=61.8,  
Degree of Freedom=21, P-value=.000  
CMIN/DF=2.943  
RMSEA=.035, TLI=.987, CFI=.992,  
NFI=.989, GFI=.991, AGFI=.981

Four exogenous latent constructs: PE = Performance expectancy, EE = Effort Expectancy,  
SI= Social Influence, FC = Facilitating Conditions

**Figure 7.1 Standardized estimates for four exogenous latent constructs**

Further the pattern and structure coefficients (see Table 3 in *Appendix XIII*) indicated that four latent constructs in the model are empirically discernible. These confirmed the discriminant validity of the four exogenous latent constructs in the model.

#### 7.4.2 Discriminant validity of endogenous constructs

First, the sample correlation matrix was examined to check for the multicollinearity. It was found that there was a correlation value (between two indicators BI1 and BI2) exceeds 0.80 (see Table 4 in *Appendix XIII*) indicating the existence of multicollinearity. The correlation between BI1 and BI2 was 0.816 and as such one of the indicators in that pair had to be deleted. A total of six indicators were deleted and only nine indicators were retained for further analysis. Then the standardized residual covariance was investigated and it found the existence of four pairs of indicators that presented higher values which were exceeding absolute 2 (see Table 5 in



*Appendix XIII*). Therefore two more indicators, BIS4 and BIT2 were removed from the model and only seven indicators were left for further analysis.

The correlation between two latent constructs was 0.325 in discriminant validity analysis and it indicates that the seven indicators were different in the research model (see Figure 7.2). The model yielded the goodness of fit with the measures,  $\chi^2$  (chi-square) value as 24.182, degree of freedom = 13, p-value = 0.029, CMIN/DF=1.86, RMSEA=.024, TLI=.996, CFI=.998, NFI=.995, GFI=.996, and AGFI=.991. Further the pattern and structure coefficients indicated that two endogenous latent constructs are empirically distinguishable (see Table 7 in *Appendix XIII*). These measures indicated discriminant validity of two endogenous latent constructs in the model.

## **7.5 ICT USE AND ACCEPTANCE MODEL**

The proposed research model in Chapter Three (see Figure 3.1 in p. 65), which demonstrates the potential influence of four latent constructs (exogenous variables) (PE, EE, SI and FC) towards the use behavior (UB) and the behavior intention (BI) to future use (endogenous variables) and the eight moderator effects of the determinants on use behavior and behavior intention was structured. It was tested in two phases. In Phase 1, the basic model was first tested by investigating only the determinants and use behavior and behavior intention. Three groups of hypotheses were tested in that phase. The basic model was then tested by investigating the impact of the moderators on the influence of the determinants by using multiple-group analysis in Phase 2. Two groups of moderating hypotheses were tested there.

### **7.5.1 Phase 1: Basic model**

The basic model was formulated to test the following three categories of alternative hypotheses.

#### **Determinant and use behavior (H<sub>1a</sub>)**

H<sub>11a</sub>: Performance expectancy (PE) has a significant influence on ICT use behavior

H<sub>12a</sub>: Effort expectancy (EE) has a significant influence on ICT use behavior

H<sub>13a</sub>: Social influence (SI) has a significant influence on ICT use behavior

H<sub>14a</sub>: Facilitating conditions (FC) have a significant influence on ICT use behavior

#### **Determinants and behavior intention to future use (H<sub>2a</sub>)**

H<sub>21a</sub>: Performance expectancy (PE) has a significant influence on behavior intention of ICT use

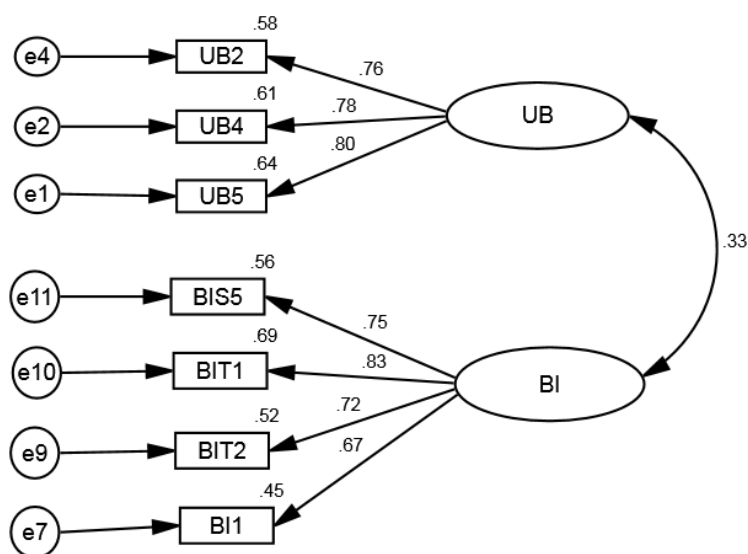
H<sub>22a</sub>: Effort expectancy (EE) has a significant influence on behavior intention of ICT use

H<sub>23a</sub>: Social influence (SI) has a significant influence on behavior intention of ICT use

H<sub>24a</sub>: Facilitating conditions (FC) has a significant influence on behavior intention of ICT use

### Use behavior and behavior intention to future use (H<sub>3a</sub>)

H<sub>31a</sub>: ICT use behavior (UB) has a significant influence on behavior intention of ICT use (BI)



Standardized Estimates,  
Chi-square=24.182,  
Degree of Freedom=13, P-value=.029  
CMIN/DF=1.86  
RMSEA=.024, TLI=.996, CFI=.998,  
NFI=.995, GFI=.996, AGFI=.991

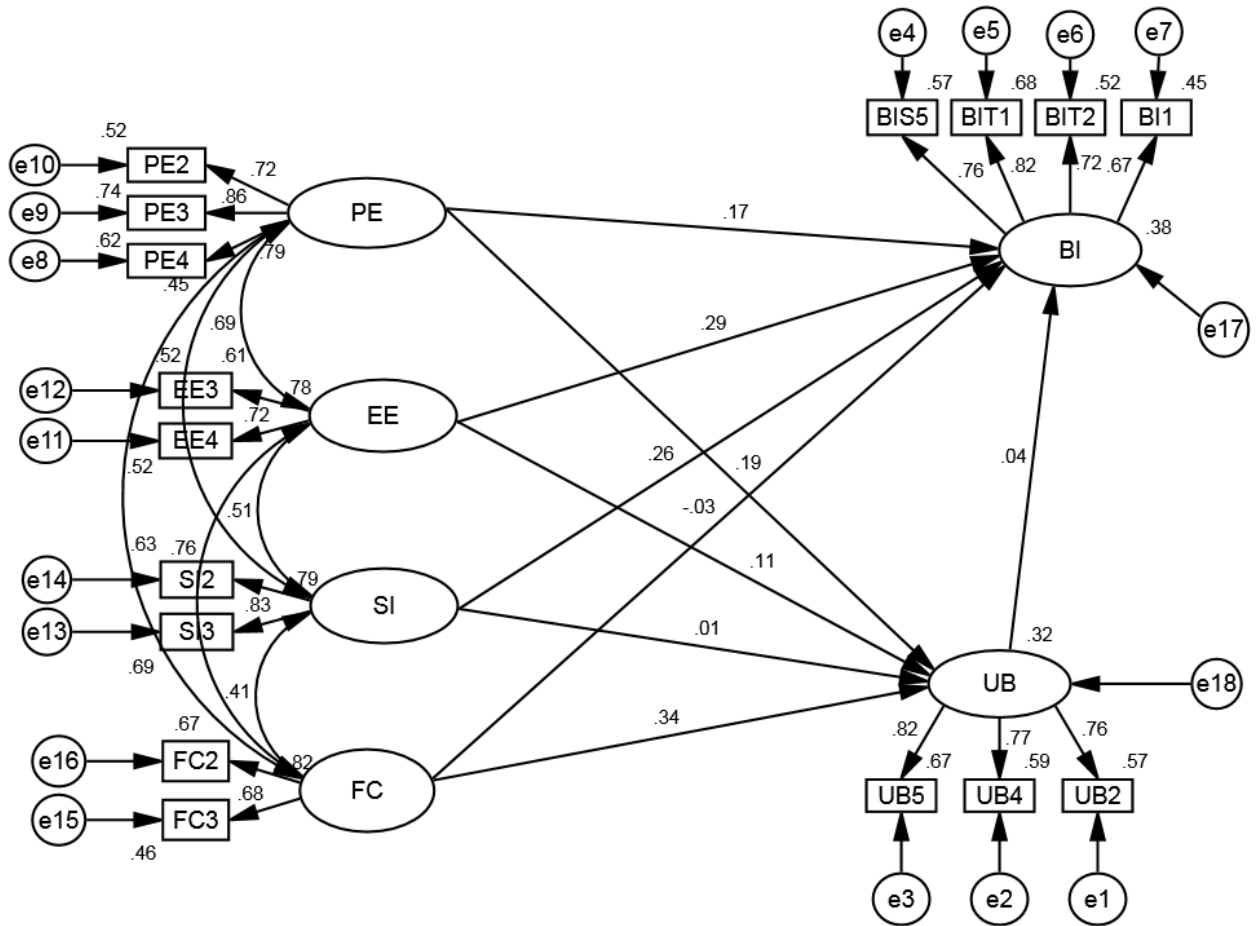
Two endogenous latent constructs: UB = Use behavior of ICTs, BI = Behaviour intention to use ICTs

**Figure 7.2: Standardized estimates for two endogenous latent constructs**

The initial model with standardized estimates before modifications is presented in Figure 7.3. It is clear that the initial model fit is good enough. The model yielded the goodness of fit with the measures,  $\chi^2$  (chi-square) value was 198.55, degrees of freedom = 89, p-value = 0.000, CMIN/DF=2.231, RMSEA=.028, TLI=.986, CFI=.989, NFI=.981, GFI=.984, and AGFI=.976. Further, it was found that there was no sample correlation that exceeds 0.8 (see Table 8 in *Appendix XIII*). However, two pairs of indicators have standardized residual covariances with greater than absolute 2 (see Table 9 in *Appendix XIII*) which indicates the lack of validity of the model.

Then the initial model was further revised using modification indices proposed in the AMOS output for the best model fit. The resultant best fit model is presented in Figure 7.4 with standardized estimates. It demonstrates the standardized regression weights, correlations, and squared multiple correlations. This model has power to explain current ICT use behavior and

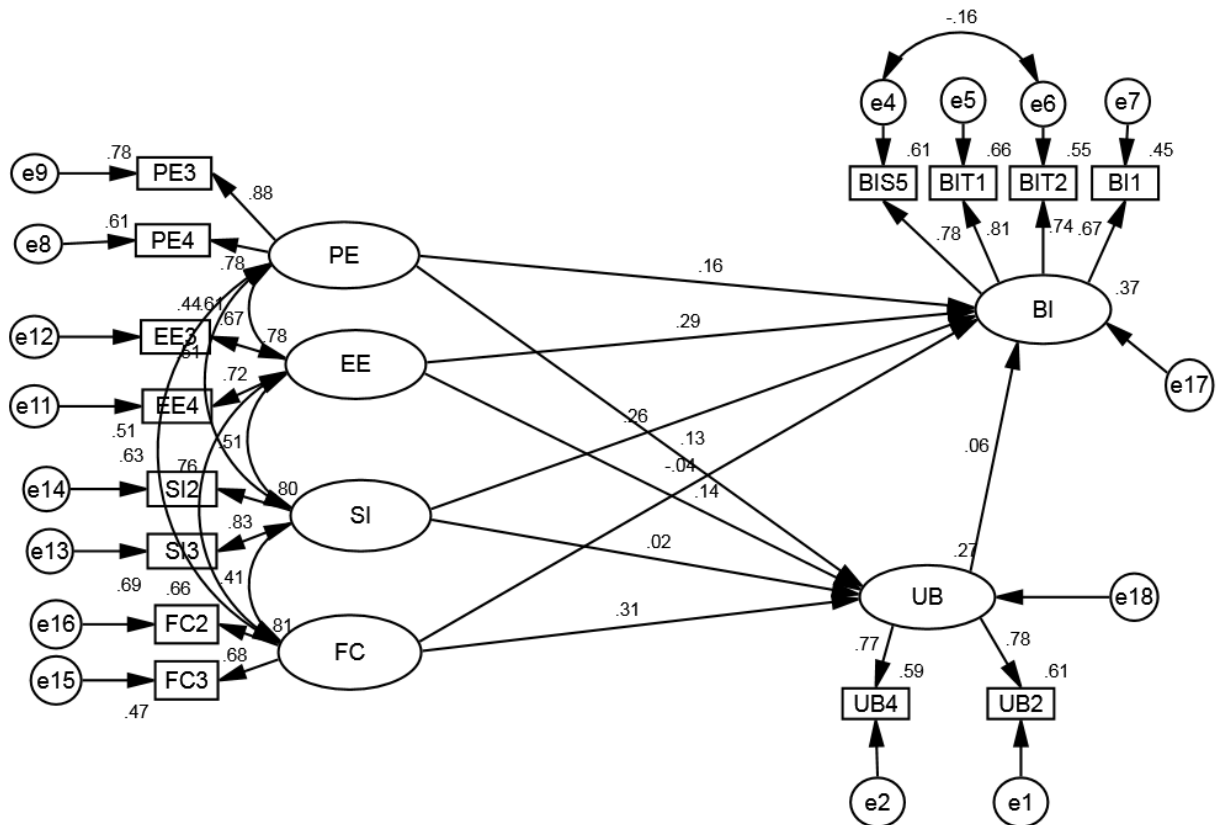
predict university students' intention to use ICTs in the future. Not a single pair of correlations was found to exceed 0.8 and thus confirmed the validity of the model with the non-existence of standardized residual covariance as greater than absolute 2 (see Table 10 and Table 11 in Appendix XIII).



**Figure 7.3: Initial model with standardized estimates**

The modified model in Figure 7.4 yields a  $\chi^2$  (chi-square) of 103.807, degrees of freedom = 61 and p- value = 0.001. However, since the chi-square statistic is sensitive with sample size other model fit measures were further considered for the confirmation of the best fit. Those fit measures also indicated the goodness of fit of the model to the data (CMIN/DF = 1.702, RMSEA

= 0.021, TLI= 0.992, CFI = 0.995, NFI = 0.988, GFI = 0.990, AGFI = 0.984) (see Table 4.6 in p. 91 for the reference of fit measures).



**Figure 7.4: Modified model with standardized estimates**

As shown in Table 7.5, the modified model shows that most of the paths, except some are statistically significant at the 0.05 level of significance ( $p\text{-value} < 0.05$ ). The path between the use behavior and behavior intention to use is significant under the 0.1 significance level ( $p\text{-value} < 0.1$ ). According to Table 7.5, two research alternative hypotheses between determinants and use behavior could be accepted under the 0.05 level. They are  $H_{11}$  and  $H_{14}$ . This suggests that performance expectancy and facilitating conditions significantly influenced current use behavior of ICTs. Three hypotheses,  $H_{21}$ ,  $H_{22}$  and  $H_{23}$  between determinants and behavior intention to use could be accepted under the 0.05 significance level. It is thus confirmed that the

performance expectancy, effort expectancy and social influence significantly impact on the behavior intention to use ICTs. However, the hypothesis H<sub>31</sub> could be accepted under the 0.1 significant level indicating that the current use behavior affects the behavior intention to the future use of ICTs.

**Table 7.5****Regression weights of the modified model**

	<b>Estimate</b>	<b>S.E.</b>	<b>C.R.</b>	<b>P</b>
UB <--- PE	.200	.080	2.509	.012
UB <--- FC	.533	.115	4.620	***
UB <--- SI	.029	.061	.478	.633
UB <--- EE	.232	.147	1.574	.115
BI <--- EE	.320	.085	3.789	***
BI <--- PE	.161	.045	3.532	***
BI <--- UB	.041	.022	1.890	.059*
BI <--- SI	.267	.036	7.484	***
BI <--- FC	-.043	.066	-.652	.515

\*P-value is significant under 0.1 significance level

Source: Calculations by the author

The standardized regression weights give the relative impact between the determinants and the behaviors. They further allow the researcher to compare directly the relative effect of each independent variable on the dependent variable (Hair et al., 2006). Following Table 7.6 depicts the standardized regression weights between the independent and dependent variables.

**Table 7.6****Standardized regression weights of the modified model**

	<b>Estimate</b>	<b>Significance (under 0.1)</b>
UB <--- PE	<b>.128</b>	Sig.
UB <--- FC	<b>.314</b>	Sig.
UB <--- SI	.019	-
UB <--- EE	.138	-
BI <--- EE	<b>.295</b>	Sig.
BI <--- PE	<b>.160</b>	Sig.
BI <--- UB	<b>.064</b>	Sig.
BI <--- SI	<b>.263</b>	Sig.
BI <--- FC	-.039	-

Source: Calculations by the author

Table 7.6 clearly demonstrates the strong effects of determinants on behaviors (for the significance paths). The effect of facilitating conditions on current use behavior (0.314) is relatively higher. This suggests that higher the level of performance expectancy and facilitating conditions toward current use of ICTs by university students is greater than the extent of the ICT use. Moreover, this further suggests that higher the level of performance expectancy, effort expectancy, social influence and current use behavior toward using the ICTs, greater the extent of the intention to use the ICTs in the future. The effect of current use behavior is albeit small on behavior intention on future use of ICTs (0.64).

Further, the covariance between the factors suggests that all the factors are significantly interrelated. As depicted in Table 7.7, the covariance between the factors is positively correlated with each other.

**Table 7.7**

**Covariance between the factors in modified model**

	<b>Estimate</b>	<b>S.E.</b>	<b>C.R.</b>	<b>P</b>
PE <--> EE	.301	.020	15.320	***
PE <--> SI	.244	.018	13.509	***
PE <--> FC	.196	.017	11.292	***
EE <--> SI	.228	.017	13.094	***
EE <--> FC	.312	.021	15.127	***
SI <--> FC	.180	.017	10.739	***

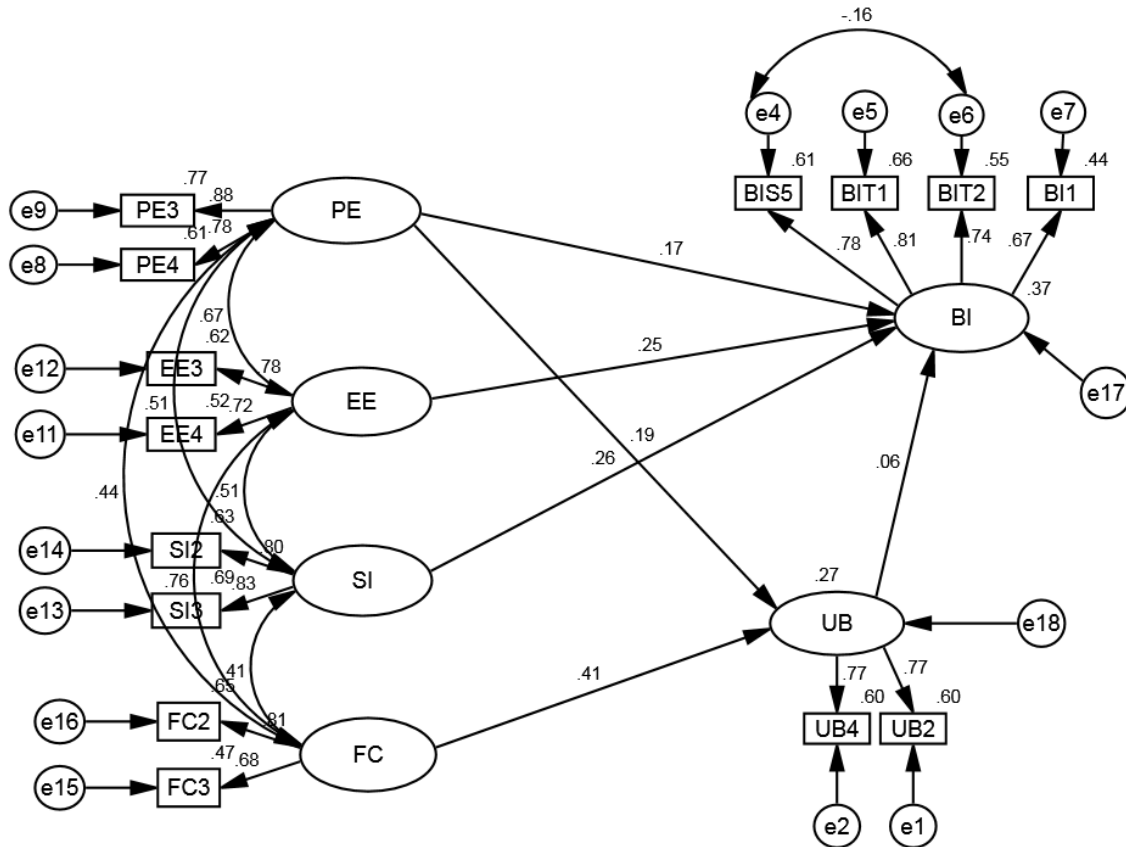
Source: Calculations by the author

Table 7.7, indicates that effort expectancy is positively correlated with facilitating conditions (0.312) suggesting the higher the ICT facilities for the students, higher the perception of the ease of work using ICTs.

The squared multiple correlation of a variable is the proportion of its variance that is accounted for by its predictors (Arbuckle, 2007). According to that the determinants, performance expectancy, effort expectancy, social influence and the facilitating conditions account for 26.8% of the variance of usage behavior. Also, 37.5% of the variance of behavior intention to future use of ICTs is accounted for the prediction from the determinants, performance expectancy, effort expectancy, social influence and current use behavior.

According to the Kremelberg (2010), it would be relevant to perform ‘**model trimming**’ to determine the final model fit. Model trimming is the process in which non-significant paths in

the model are removed and the model is re-run until no more non-significant paths remain (Kremelberg, 2010). After the model trimming process, the final model which is depicted in Figure 7.5 could be drawn as the final basic model. It describes the ICT use and acceptance of ICTs by university students for the Sri Lankan context.



**Figure 7.5: Final basic model with standardized estimates**

The final model yields a  $\chi^2$  (chi-square) of 107.2, degrees of freedom = 64, p- value = 0.001, CMIN/DF = 1.675, RMSEA = 0.021, TLI= 0.993, CFI = 0.995, NFI = 0.987, GFI = 0.990, AGFI = 0.984. The model contains only the significant paths and Table 7.8 confirms that. 27.3% of variance of use behavior is predicted by the determinants and 37.1% of variance of behavior intention of use is predicted by the determinants and current use behavior.

**Table 7.8****Regression weights of the final model**

	Estimate	S.E.	C.R.	P	Standardized regression weights
UB <--- PE	.297	.055	5.397	***	.192
UB <--- FC	.690	.068	10.165	***	.409
BI <--- EE	.274	.050	5.472	***	.252
BI <--- PE	.173	.041	4.185	***	.173
BI <--- UB	.042	.021	2.029	.042	.065
BI <--- SI	.266	.036	7.493	***	.263

Source: Calculations by the author

In the final basic model, performance expectancy and facilitating conditions significantly explained the current ICT use behavior. Performance expectancy, effort expectancy, social influence and current use behavior significantly explained the behavior intention to future use of ICTs by university students. However, the capability of explaining the variance of behavior intention to future use is stronger (37.1%) than in explaining the variance of current use behavior (27.3%) by determinants.

### 7.5.2 Phase 2: Model with moderator effects

After formulating the final model, it is needed to make further investigations to find the moderating effects as constructed in the proposed research model (see Figure 3.2). Effects of the four socio-demographic moderators (gender, age, ICT experience and faculty) and four cultural moderating factors (masculinity/femininity, individualism/collectivism, uncertainty avoidance and power distance) had to be tested on all determinants towards the use behavior and the behavior intention. Three groups of hypothesis were formulated.

#### **Moderation among determinants and use behavior (H<sub>5a</sub>)**

H<sub>41a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by gender

H<sub>42a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by age

H<sub>43a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by ICT-experience

H<sub>44a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by main subject stream (faculty)



H<sub>45a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by masculinity/femininity

H<sub>46a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by individualism/collectivism

H<sub>47a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by uncertainty avoidance

H<sub>48a</sub>: The influence of determinants (PE, EE, SI and FC) towards use behavior (UB) is moderated by power distance

#### **Moderation among determinants and behavior intention to future use (H<sub>5b</sub>)**

H<sub>51b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by gender

H<sub>52b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by age

H<sub>53b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by ICT-experience

H<sub>54b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by main subject stream (faculty)

H<sub>55b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by masculinity/femininity

H<sub>56b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by individualism/collectivism

H<sub>57b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by uncertainty avoidance

H<sub>58b</sub>: The influence of determinants (PE, EE, SI and FC) towards behavior intention to future use (BI) is moderated by power distance

#### **Moderation between use behavior and behavior intention to future use (H<sub>6c</sub>)**

H<sub>61c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by gender

H<sub>62c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by age

H<sub>63c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by ICT-experience

H<sub>64c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by main subject stream (faculty)

H<sub>65c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by masculinity/femininity

H<sub>66c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by individualism/collectivism

H<sub>67c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by uncertainty avoidance

H<sub>68c</sub>: The influence of use behavior (UB) towards behavior intention to future use (BI) is moderated by power distance

Multi-group moderation analysis in which comparing critical ratios (z-scores) calculated to represent the magnitude of the difference between groups on each of the theorized paths to assess if the standardized effects differed across groups were performed to test the those group of hypotheses. The summary of the results is depicted in Table 7.9.

**Table 7.9**

**Summary of findings – Multi-group moderation (z-scores)**

Hypotheses	Socio-demographic moderators (Z-Score-values)				Cultural moderators (Z-Score-values)			
	Gender	Age	ICT Exp	Common subject	MF	IC	UA	PD
UB <--- PE	-0.822	0.826	0.265	0.534	3.129***	-0.254	1.159	0.889
UB<--- FC	-0.254	1.115	0.225	1.332	-1.037	-0.625	0.029	-1.487
BI <--- EE	0.237	-1.044	1.382	1.373	-1.352	-1.728*	-1.178	0.669
BI <--- PE	0.903	1.227	-1.002	-1.192	0.403	0.392	0.622	-2.175**
BI <--- UB	-0.997	-0.801	1.224	0.338	1.514	0.228	0.176	1.350
BI <--- SI	0.086	0.919	0.628	-2.793***	-2.673***	1.869*	2.685***	-1.273

Notes: \*\*\* p-value < 0.01; \*\* p-value < 0.05; \* p-value < 0.10

Source: Calculations by the author

Table 7.9 demonstrates that gender, age and ICT-experience were not significantly different between any of the determinants and use behavior, intention to use behavior and between use behavior and intention to use behavior. Therefore, the hypotheses H<sub>41a</sub>, H<sub>42a</sub>, H<sub>43a</sub>, H<sub>51b</sub>, H<sub>52b</sub>, H<sub>53b</sub>, H<sub>61c</sub>, H<sub>62c</sub> and H<sub>63c</sub> were rejected. Other hypotheses could be accepted under the 0.1 significance level. Group comparison was performed using the estimates depicted in Table 7.10.

**Table 7.10****Summary of findings – Multi-group moderation (estimates, p-values and z-scores)**

Path	Socio-demographic moderators		Z-score	Cultural moderators		Z-score
UB <--- PE				Femininity <-	-> Masculinity	
				0.173 (0.024)	0.544 (0.000)	3.129***
BI <---EE				Individual <-	-> Collective	
				0.462 (0.001)	0.197 (0.000)	-1.728*
BI <--- SI				Femininity <--	-> Masculinity	
				0.329 (0.000)	0.124 (0.046)	-2.673***
	Arts	Non-Arts		Individual <--	--> Collective	
	0.389 (0.000)	0.185 (0.000)	-2.793***	0.103 (0.235)	0.282 (0.000)	1.869*
				Low-UA	High-UA	
				0.088 (0.232)	0.318 (0.000)	2.685***
BI <--- PE				Low-PD	High-PD	
				0.261 (0.000)	0.045 (0.599)	-2.175**

Notes: \*\*\* p-value < 0.01; \*\* p-value < 0.05; \* p-value < 0.1

Source: Calculations by the author

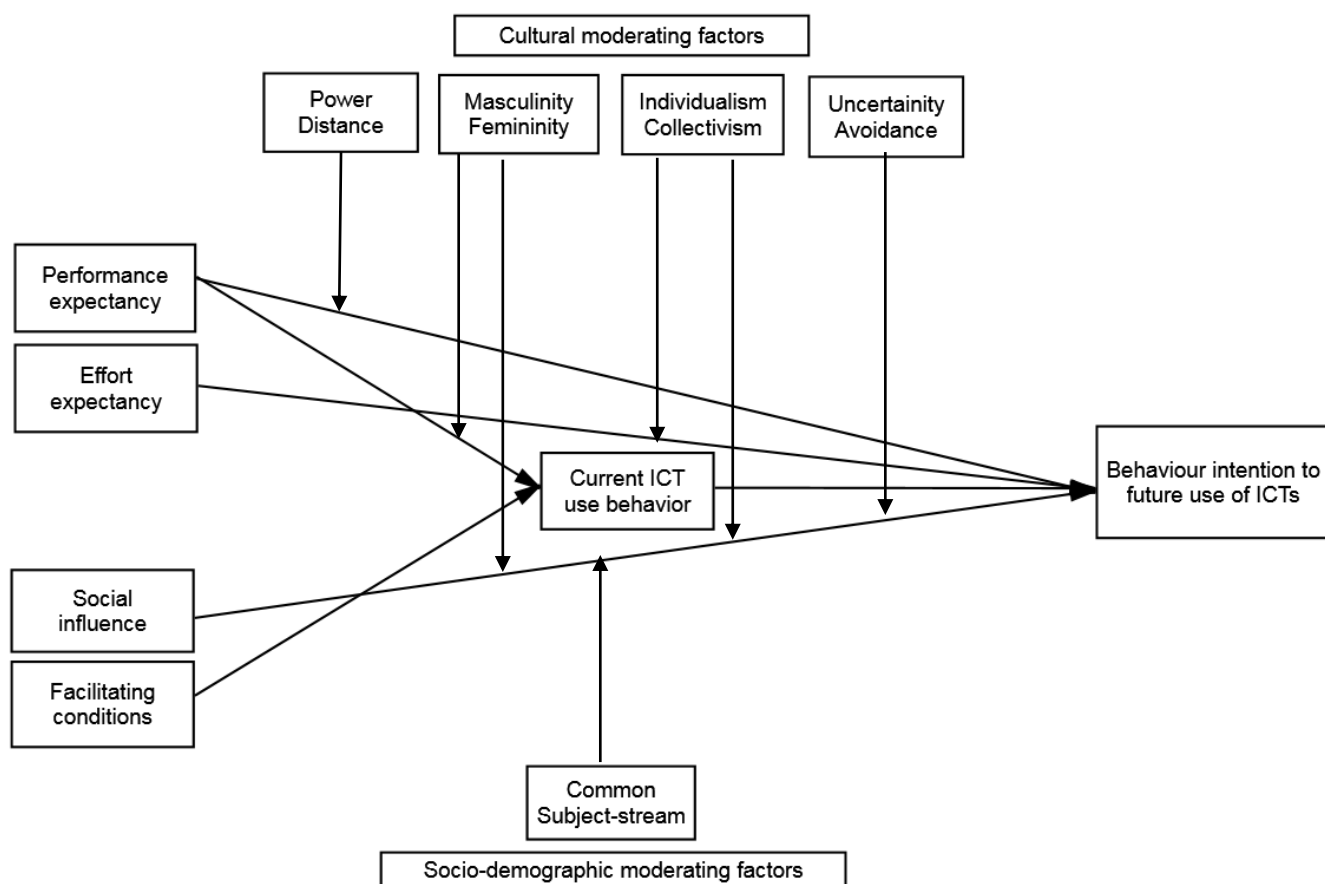
Table 7.10 indicates that the effect of performance expectancy on use behavior was significantly different between those with masculinity and femininity values. Results indicated that, performance expectancy is a stronger determinant of current ICT use behavior for individuals who espouse masculine cultural values.

It was found that the effect of effort expectancy on behavior intention to use significantly differed between those with individualistic and collectivistic cultural values. It shows that the effort expectancy is a stronger determinant on behavior intention to future use of ICTs for individuals who espouse individualistic cultural values.

Table 7.9 further depicts that the effect of social influence on behavior intention to future use of ICTs is greater for students from Arts subject streams. Also, the effect of social influence on behavior intention to future use ICTs is higher for the individuals who espouse feminine cultural values, collectivistic cultural values and high uncertainty avoidance values. Moreover the individuals who espouse high power distance values believed that the performance expectancy as a stronger determinant on the behavior intention to future use of ICTs.

## 7.6 ICT USE AND ACCEPTANCE MODEL (ICTUAM)

The final model with the effects of determinants and the moderators was formulated and named as the ICT Use and Acceptance Model (ICTUAM) which is depicted in Figure 7.6.



**Figure 7.6: ICT Use and Acceptance Model (ICTUAM)**

ICTUAM is the model which describes the current use behavior and the intention to future use of ICTs by university students in Sri Lanka. Overall, the structural model had excellent model fit: GFI = 0.99, CFI = 0.995, RMSEA = 0.021, PClose = 1.000, and CMIN/DF = 1.675. In the model, performance expectancy and facilitating conditions are the determinants which describe the current ICT use behavior and they explain 27.3% of the variance. Masculinity/femininity has a significant moderating effect on the relationship between performance expectancy and current use behavior.

Behavior intention towards future use of ICTs by university students in Sri Lanka is described by the performance expectancy, effort expectancy, social influence and current use behavior in the ICTUAM. It explains 37.1% of the total variance. Power distance moderated the relationship

between performance expectancy and the behavior intention to the future use of ICTs. The relationship between the social influence and behavior intention to future use of ICTs is moderated by ICT-experience, masculinity/femininity, individualism/collectivism and uncertainty avoidance. Individualism/collectivism has a significant moderating effect on the relationship between effort expectancy and behavior intention to future use of ICTs by university students in Sri Lanka.

## **7.7 SUMMARY**

The purpose of this study was to formulate a model which describes the current use behavior and the intention to future use of ICTs by university students in Sri Lanka. Initially in the chapter, it confirmed the construct reliability and discriminant validity. Then the proposed research model was tested in two phases. First, the research model was constructed using SEM techniques by investigating only the determinants and behaviors. Next, the impact of the moderators on the influence of the determinants/predictors on current use behavior and behavior intention to future use was examined using the multi-group analysis. Finally, the model which is called “ICT Use and Acceptance Model (ICTUAM)” was drawn with an excellent model fit. More importantly, ICT-experience and the cultural factors moderated the relationships in the model. Finally the model describes the current use behavior and the intention to future use of ICTs by university students in Sri Lanka. Moreover, the model has the power to explain 27.3% of the variance of current use behavior and 37.1% of the variance of behavior intention to the future use of ICTs. The next chapter summarizes the key findings of the study, its theoretical, methodological, managerial implications along with the limitations of the study and recommendations for further research.

## **CONCLUSIONS AND SUGGESTIONS**

### **8.1 INTRODUCTION**

The previous chapter presented the analysis of data and the discussion of emerging findings. This chapter summarizes the key findings along with methodological and practical implications. The limitations of the study and suggestions for further research are also discussed.

### **8.2 KEY FINDINGS**

This study focused on proposing a model for assessing the extent to which individual characteristics describe current use behavior and future acceptance of ICTs by university students in the Sri Lankan context. In order to achieve the main aim of the study, following specific objectives could be formulated.

1. To assess what types of ICTs are used by university students in Sri Lanka.
2. To assess the extent to which Sri Lankan university students use and intend to use ICTs.
3. To identify the effect of socio-demographic factors on ICT use and acceptance of university students.
4. To investigate how university students are motivated to improve the use of ICTs.
5. To propose a model which best describes the ICT use and acceptance by university students in Sri Lanka

Data were collected from the first year and third year students from four universities located in the Colombo metropolitan area and rural areas in Sri Lanka with a 72.16% (1682 out of 2331) satisfactory response rate and the reliability and validity of the survey instrument could be achieved. Data collected in relation to the first objective was investigated and presented in Chapter Five and Six. Next three objectives were analysed and presented in Chapter Six. Model testing was performed and presented in Chapter Seven. Key findings of those sections are summarized in the following sections.

#### **8.2.1 Socio-demographic and cultural background of the respondents**

The respondents' profile indicated that the majority of students were female (74.1%), and were in the age range of 20-25 years (97.2%). Two-thirds of university students who responded to the survey were female and a big age difference among them could not be seen. Most of the respondents were Sinhala (81.0%), and Buddhist (78.1%). It reveals that there is not a huge

variation of the sample regarding the ethnicity and religion when compared with the composition of the population in the country. Most of the students had come from rural areas (60%).

Majority of the respondents' individual cultural values about masculinity/ femininity moved a closer towards femininity cultural values (mean =1.88). Most of the respondents preferred a low power distance cultural direction (mean=1.7). Moreover, the respondents individually possessed a higher espoused collectivism (mean=2.8) cultural thoughts and high espoused uncertainty avoidance (mean=2.69) cultural values.

### **8.2.2 Students' background in relation to ICT use**

Analysis of students' background related to ICT usage indicated that a larger number of students (68.4%) had followed ICT courses before entering the university. Majority (85.4%) of them had followed desktop application courses and 40.3% of them had followed WWW and Internet related courses. This information reveals that the majority of the students had identified ICTs as an important component for the future and that therefore they tend to follow ICT courses systematically. Although almost all the universities conduct ICT related courses for freshmen, the highest percentage of students of the sample (57.4%) claimed that they have not followed ICT courses after entering the university. These courses being optional courses may be a reason for this result. 42.6% of students stated that they had followed ICT related courses at the university and a majority of them (20.6%) had followed the introductory courses.

Most of the students had access to computer facilities (86.2%) and internet facilities (76.4%) whenever they needed and most of them had used their own mobile devices (72.5%) to access ICTs. It reveals that the majority owns ICT facilities enabling easy access in this context.

Majority of students had 0-5 years' long experience (79.1%) and only 14.7% had more than 10 years longer experience of more than 10 years. It thus appeared that almost all the university students possess the capability to access ICTs. In terms of the length of experience, 29% of urban students assessed themselves as having more than 5 years' experience as compared with only 15.5% of rural students. This means that on average, urban students have longer ICT experience than rural students. This could be due to the digital divide. Moreover, the third year students have higher ICT experience (more than 10 years) (73.6%) as compared to only of 62.8% first year students. Third year students have spent more than 3 years in the university with ICT facilities than the first year students and therefore they could have more than 5 years of ICT experience. Moreover, Science students were seen to possess a longer ICT experience (more than 5 years) (34.1%) as compared to Arts and Management students. On the other hand, the majority

of the Arts students (87.4%) have only lower ICT experience (0-5 years) as compared to Science and Management students. Most of the time, students who learn Arts subjects, tend to degrade technologies and this may be because they have lower ICT experience.

Most of the students have self-reported that they possessed a moderate level of skill (78.5%) in ICTs. Males have (5.7%) higher ICT skills compared to their female counterparts. This may be because in nature, males are considered as more technology-oriented than females and they are also more active in striving to improve their skills with new technology than females. While a majority of rural students (22.2%) have poor ICT skills, urban students have (87.4%) moderate and high ICT experience compared to rural students. Third year students (3.3%) have high ICT skills compared to only 02.9% of first year students.

### **8.2.3 Types of ICT tools used by the students and their intention to use**

Usage frequency of 20 different ICT tools identified in the literature was considered and it was found that the Internet searching is the tool which has the greatest frequency of use (“use several times a day”) by the majority of the students (35.9%). This may be because the net generation mostly relies on the Internet for each and every purpose. Even though the lecturers and the employers in the job market believe that e-mail is a tool, which fresh graduates should be equipped with, the majority of the respondents used e-mail (26.1%) only about once a week, 22.2% used e-mail once a day and 20.9% used e-mail several times a day. Net generation currently makes use of social networks for communication and therefore does not make use of e-mail frequently. It is evident by the result that the highest percentage of students (33.2%) use social networks like face book several times a day. Most of the respondents used word processing (37.3%), spreadsheets (40%) and presentation packages (46%) about once a month.

University students intend to use ICT tools which they currently use, more frequently (“use about once a day=3”) (mean=2.91) in the future. The students agreed (mean=2.95≈3) that in the future they need to use the participatory media, computer programming, web designing and online banking etc. which were not used at all by the majority. Further, the students intend to increase the frequency of using those new ICT tools “about once a day” (mean 2.93) on average. Results further revealed that the students have an idea to improve their individual ICT use of different ICT tools.

### **8.2.4 Extent to which university students use and intention to use ICTs**

The highest frequency of University students using ICTs, - “several times a day” was for communication purposes (25.1%) and other purposes such as entertainment (23.1%). A majority



of the students had used ICTs “about once a week” for academic and educational purposes (27.8%). However, most of the respondents have not used ICTs for technical purposes (53.1%) at all. Thus, the current overall use of ICTs by the majority of university students was confined to “about once every week” (29%) which means that the Sri Lankan university students in the sample appear to have used ICTs to some extent only. However, the results reveal that the students’ intention on future use is higher for every purpose even though, overall, the current use is unsatisfactory.

### **8.2.5 Effect of socio-demographic factors on ICT use and intention to use**

The effect of four socio-demographic factors: gender, age group, ICT experience and main subject stream (Faculty) on current use frequencies of ICTs for various purposes and overall as well as on behavior intention to future use was examined and yielded the following results.

- More male respondents were shown to be using ICTs to a higher extent than female respondents for social communication use, technical use and other use of ICTs. Generally, males were more interested in using ICTs.
- Current use of ICTs for social communication activities was higher for older (above 25 years) students than for others. However, respondents from the 20-25 age group intended to use ICT for technical purposes to a greater extent than the other groups.
- While academic/ educational use of ICTs was higher for the respondents who have 6-10 years’ ICT experience, in three other uses (social communication, technical and other purposes) the frequencies were higher for the more experienced (more than 10 years) respondents than others. The intention related to future use of ICTs for academic/ educational, social communication, other use and the overall use was higher for the more experienced (more than 10 years) respondents than for others.
- Current use frequency for academic purposes, social communication purposes, technical use, other uses and finally the overall use of ICTs of respondents from Science subject streams was higher than of those from Arts and Management subject streams. Generally, the students from the Science stream had more experience in practical applications of ICTs for their courses. While Science students mostly intended to use ICTs for social communication activities and other uses such as entertainment in the future, Arts students intended to use ICTs for technical purposes in the future.

### **8.2.6 Motivations to make full use of ICTs**

Majority of the students (43.1%) agreed that they still have not made full use of the ICTs, but that they intend to use ICTs more in all types of work in the future (mean=3.03). Students acknowledged the following as important motivating factors:

- 1 Availability of helping persons in difficulties
- 2 Having updated trainings/ workshops/ courses regularly
- 3 Availability of satisfactory facilities
- 4 Changes of curriculum to be ICT oriented in the future
- 5 The university policy to develop e-University in the future

More female students as well as Arts students have claimed that they are motivated to make full use of ICTs if they have updated trainings/ workshops/ courses regularly on ICTs.

Arts students, students in the 20-25 age group and students who have more than 10 years' experience in using ICTs have claimed that they are motivated to make full use of ICTs if changes are taking place in the curriculum to be ICT oriented in the future.

Students who possess more than 10 years' experience in using ICTs have declared that they would be motivated to make full use of ICTs if the university policy moves to be an e-University in the future.

### **8.2.7 Students' comments on use and future acceptance of ICTs**

Even though the universities regularly improve their ICT infrastructure at Faculty levels, a majority of the students (39.8%) mentioned that they need more facilities to use ICTs. Thirty-one percent have claimed that they need additional knowledge in using ICTs. However, 22.5% of the respondents have recognized that they should use ICTs by themselves at a higher level to meet demand at the job market more successfully. Therefore, raising awareness among students about the importance of ICT use, integrating use of ICT in both formative and summative assessment making ICTs compulsory for them will be useful for the future acceptance of ICTs.

## **8.3 ICT USE AND ACCEPTANCE MODEL**

The focus of this research was to formulate a model which best describes the use and acceptance of ICTs by university students in Sri Lankan universities. The proposed research model integrated determinants and moderators from prominent theories/models on individual acceptance of information technology including UTAUT after a review of the empirical studies in the individual, organizational, and cultural contexts.

The proposed research model was tested and modified using the 1551 usable data drawn from the cross-sectional survey of first year and third year university students in four reputed universities located in the Colombo area and rural areas. Finally the “ICT Use and Acceptance Model (ICTUAM)” was finalized using SEM as a statistical technique with AMOS.

ICTUAM is the model which describes the current use behavior and the intention to future use of ICTs by university students in Sri Lanka. Overall, the structural model had an excellent model fit: GFI = 0.99, CFI = 0.995, RMSEA = 0.021, PClose = 1.000, and CMIN/df = 1.675. Moreover, the model is well capable of explaining the variances in four latent constructs by examining the Square Multiple Correlation (SMC) which is equivalent to the  $R^2$  statistic (Sharma, 1995). SMC value for the current use behavior is 27.3% and for behavior intention to future use value is 37.1%. The capability in explaining the variances of use behavior and behavior intention to future use of the model presented a considerable amount over the technology acceptance theories and models (see Table 2.1 in p.40).

Some features are evident to prove the uniqueness of this model:

1. The model displays a structure with an intrinsic dynamism of the ICT use and acceptance behavior of university students in Sri Lanka.
2. It integrates prevailing literature in Information Science and includes aspects of linearity and complexity of the constructs.
3. The model includes cultural dimensions that have not been considered in other ICT use and acceptance models developed in relation to university students.
4. The socio-demographic and cultural influences were also considered in the model to predict a best description that cannot be found from other similar models.

Finally, the proposed research model consists of four major determinants of use behavior and the behavior intention to future use of ICTs: performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating conditions (FC) and four individual characteristics moderators: gender, age, ICT-experience and faculty (main subject stream) and four individual cultural moderators: masculinity/femininity, individualism/collectivism, uncertainty avoidance and power distance.

### ***Performance expectancy***

As performance expectancy (or perceived usefulness) has received considerable attention in the technology acceptance research literature (see Chapter Three), it presents a significant influence on usage behavior and behavior intention to future use as well in the current model. This

suggests that students use and expect to use ICTs because they believe that the ICTs were useful for them. This perception has motivated them to make use of ICTs for their work.

### ***Effort expectancy***

It is evident in the past literature that the effort expectancy (perceived ease of use) has been found to have a significant influence on behavior intention by many technology acceptance studies based on UTAUT in university settings (see Chapter Three) and it was found as a significant determinant for usage behavior too (Kripanont, 2007). However, in the model developed to the Sri Lankan context the effect of the effort expectancy was not significant for current ICT usage behavior, but it was a determinant of future acceptance of ICTs by university students. It may be because the ease associated with ICTs in performing their activities in university is not much relevant, but the students responded that they tend to use ICTs in the future because they perceive the ease associated with ICTs is motivating them.

### ***Social influence***

While many researchers have argued whether the effect of social influence on behavior intention in various settings was significant or not (see Chapter Three), some have argued for the significance of social influence on usage behavior (Schaper & Pervan, 2007; Al-Qeisi, 2009). However, social influence has no significant influence on current usage behavior in this study. This may be because students have already had ICT experience even before entering the university. However, it affects the behavior intention to the future use of ICTs in the current model as many researchers found in different contexts (see Chapter Three). This means that students perceive that other important persons (significant others) believe they should use ICTs in the future and that this concept motivates them towards future acceptance of ICTs.

### ***Facilitating conditions***

Facilitating conditions have a significant effect on usage behavior, indicating that the students believe that institutional and technical infrastructure that exists in the university has made a big support in using ICTs for their activities. Yet, it did not have a significant effect with the behavior intention to future use in the current model. This finding, however, was not consistent with the finding of Venkatesh et al. (2003), Zhou et al. (2010) and Lin et al. (2013).

### ***Usage behavior and behavior intention to future use***

As many researchers have shown a significant correlation between behavior intention and usage behavior, current usage behavior was also a key determinant for the behavior intention to future use of ICTs in this study.

Although many researchers including Venkatesh et al. (2003) found age, gender and experience as significant moderating factors on technology acceptance, the current model did not find a significant moderating effect of those factors.

### ***Common subject stream***

The common subject stream students follow is a significant moderating factor though there was no evidence that it has functioned as a moderator in technology acceptance research. The Faculty which the students belong to, moderated the effect of social influence on behavior intention to future use of ICTs. That effect is greater for students from the Arts subject streams. It means that the students from the Arts subject stream perceive that other important persons such as lecturers believe they should use ICTs in the future and that this belief motivates them towards future acceptance of ICTs.

Moreover, the moderating effect of the individual cultural factors on the relationships between determinant and usage behavior and the behavior intention to future use is one of the specific features found in the current model.

### ***Masculinity/femininity***

Thowfeek & Jaafar (2013) found that the masculinity/femininity has a direct effect on technology adoption. Srite & Karahanna (2006) had found that the masculinity/femininity was a significant moderating factor for the effect of social norms (social influence) on behavior intention to use technology and that relationship was stronger for feminine cultures. The same result was found in the current study indicating that individuals who were aiming at personal goals such as a friendly atmosphere and warm personal relationships perceived that other important persons such as lecturers believe they should use ICTs in the future and that this concept motivates them to future acceptance of ICTs. Moreover, the influence of performance expectancy on current usage behavior of ICTs is moderated by the masculinity/femininity cultural factor. Performance expectancy is a stronger determinant of current ICT usage behavior for individuals who espouse masculine cultural values. This indicates that the individuals who are aiming at work goals such as, advancement, competitiveness, and performance believed that the ICTs were useful for their activities in the university.

### ***Individualism/collectivism***

Individualism/collectivism had been identified as a moderating factor for the effect of perceived ease of use on behavior intention to technology performances by Sanchez-Franco et al. (2009) and it was weighted more strongly by individualism. People with individualistic values prefer to

make their own decisions and therefore they themselves decide that the ease associated with technology on their activities may motivate them to use ICTs in the future. Current study also showed that the effort expectancy is a stronger determinant on behavior intention to the future use of ICTs for individuals who espouse individualistic cultural values. Further, the study found that the effect of social influence on behavior intention to future use of ICTs is higher for the individuals who espouse collectivistic cultural values. This indicates that students who espoused collective cultural values expect to use ICTs in the future because they perceive that important persons such as lecturers believe they should use ICTs. This may be because students with collectivistic cultures do not prefer to make their own decisions and members of the inner circle (family, university people and friends) were having the greatest influence (Hofstede & Bond, 1988).

### ***Uncertainty avoidance***

While Thowfeek & Jaafar (2013) found that the uncertainty avoidance has a direct effect on technology adoption, Srite & Karahanna (2006) found to a consistently significant moderating effect on the relationship between subjective norms and behavioral intention to use, and that this relationship was stronger for individuals with high levels of espoused uncertainty avoidance. This was proven by the current study suggesting that individual students who espouse high uncertainty avoidance cultural values look to their society for cues to propose whether ICT acceptance is appropriate. Therefore, they tend to accept ICTs since their lecturers, friends and others expect to use ICTs in the future.

### ***Power distance***

Thowfeek & Jaafar (2013) found that the power distance is a significant determinant of technology acceptance. Simultaneously in their study Srite & Karahanna (2006) introduced power distance as a significant moderating factor of the effect of social influence on behavior intention to use technologies. Further, they found that the relationship was stronger for individuals with low espoused power distance cultural values. A different finding was shown in the current study for the Sri Lankan context. It revealed that the power distance is a significant moderator of the influence of the performance expectancy on the behavior intention to future use of ICTs. Individuals who espouse high power distance values believed performance expectancy to be a stronger determinant on behavior intention to the future use of ICTs. This clearly indicates that the students, who were not in a relative position of power, believe that the ICTs are useful for them and it motivates them to make acceptance of ICTs for their work in the future.

## **8.4 OVERALL IMPLICATIONS OF THE RESEARCH**

The empirical evidence of this study offers a valuable contribution to the body of knowledge in two main aspects—methodological as well as practical.

### **8.4.1 Methodological contribution**

To best describe the current use behavior and the future acceptance of ICTs by university students in Sri Lanka, a combination of positivist and phenomenological inquiries was adopted in this study. The dynamism and the feasibility of the problem identified were inquired through the phenomenological approach. This approach helped to identify the real picture of ICT use behavior and the related surroundings in the universities and the job market through interviews and focus group discussions.

The procedure for model development was conducted using a series of statistical tests and it which was based upon the positivistic approach. It used a structured questionnaire survey. The researcher visited all selected universities and managed to get the questionnaires completed accurately having participated with the respondents and therefore the number of missing values was lower. The data collected was tested for reliability, content validity, construct validity (discriminant validity) and convergent validity. The methodological process was carried out using a very relevant statistical method “Structural Equation Modeling (SEM)” which is strongly recommended to be used for model developing. SEM is a powerful methodology which has a number of benefits over other multivariate techniques (Byrne 2001, 2006) (see Chapter Four for more details).

It is apparent that the above methodological contribution is unique to ICT use and acceptance behavior of university students. This is one of the major methodological contributions of the present study that expands the knowledge base of Information Science for the university context in particular.

### **8.4.2 Practical contribution**

It is essential for fresh university graduates to be equipped with ICT capabilities to meet the demand in the present job market. Therefore it is very important for university administrators to recognize the elements that play a role to promote ICT use and acceptance behavior of university students. Hence, the contribution of the key findings of this study provides significant benefits not only for individual students, but also to the Universities in Sri Lanka as well as the country.

According to the results presented in Chapter Six, a number of practical implications could be drawn to motivate students to make full use of ICTs for their work. Moreover, the ICT use and

acceptance model (ICTUAM) provides a better understanding about association of core determinants and current use behavior and behavior intention to future use of ICTs and the impact of the important moderating factors. This model in terms of both parsimony and its contribution to understanding will support to promote ICT use of university students in Sri Lanka.

As mentioned earlier, students claimed the necessity for satisfactory facilities, for helping staff and updated regular courses, an ICT oriented curriculum and the e-university policy to motivate to make full use of the ICTs. Also they commented that they need more facilities to use ICTs and future acceptance and a facilitating condition was one of the significant key determinants of the ICTUAM. If universities and the Government make use of this knowledge whenever necessary by considering the availability of satisfactory facilities, training, helping staff and by paying attention on changing curricula and policies towards ICTs that will certainly encourage students to make better use of the ICTs at a satisfactory level. Further, universities and the government could pay their attention to provide regular training or courses which are found to be very significant in encouraging individuals to have more self-confidence in their use of ICTs.

In considering the impact of common subject streams on the model, social influence should be given more attention in promoting future acceptance of ICTs for Arts students. It implies that universities have to play an important role to encourage Arts students to use ICTs.

Moreover, the ICTUAM presents the impact of the individual cultural values on ICT use and acceptance behavior which can then be useful as individual distinction constructs in theoretical models and they will enhance conceptual understanding of the phenomenon. Moderating effects of the cultural factors have direct managerial implications. Espoused cultural values (particularly masculinity/femininity and uncertainty avoidance) influence technology implementation reactions cause to alleviate resistance to use (Srite & Karahanna, 2006). Social influence is a significant determinant on the behavior intention to future use of ICTs in the ICTUAM and masculinity/femininity, individualism/collectivism and uncertainty avoidance appear to have moderated this effect. Hence, for individuals high on uncertainty avoidance and high on femininity, improvement of the social environment provides an effective mechanism to encourage acceptance of ICTs. The moderating effect of individualism/collectivism implies that social influence needs to be conceptualized in a more distinctive manner to capture minor changes of the social environment (Srite & Karahanna, 2006).



Further, the moderating effect of uncertainty avoidance on acceptance behavior may be important for management to identify uncertainty reduction mechanisms to make possible acceptance behaviors. They provide a clear indication from management on expectations with respect to acceptance of the technology, user support groups, structured learning opportunities, and availability of situated training (Srite & Karahanna, 2006). Moreover, the espoused power distance values indicate a preference to influence the impact of authority referents on behavior (Tyler et al., 2000). Espoused individualism/collectivism values indicate a preference to influence the impact of in-group referents on behavior (Bond & Smith, 1996).

Finally, the ICTUAM will support to implement university policy and National Policies especially to increase ICT use and acceptance in universities and also influence the development of the National Policy of e-university towards e-Sri Lanka.

### **8.5 LIMITATIONS OF THE STUDY**

This study was conducted reviewing a wide range of theoretical viewpoints and with a considerably larger sample representing university students in Sri Lanka. Hence the results of this study can be considered as very significant. However, there are some shortcomings and limitations in the approaches of the study.

This study was restricted to four national universities in Sri Lanka instead of the entire number (15) of universities. However, this restriction was alleviated by selecting two universities in the Colombo area and two outside Colombo, which sample can be considered as a reasonably representative sample of the universities.

The current study used a cross-sectional sample. The causal relationships can be inferred but cannot be strictly proven with cross-sectional samples. Before-after measures in a longitudinal research design with requisite controls may be well suited to properly test causality of ICT use and acceptance. Longitudinal studies take a much longer time and they are practically difficult to conduct. However, such investigations are too advanced to study the issues of technology acceptance.

### **8.6 SUGGESTIONS FOR FURTHER RESEARCH**

By considering the scope and the limitations of this study, there may be further research opportunities in a wider scope using the model developed (ICTUAM) under the current study. The same model may be used in the future considering all common subject streams in all 15 universities in Sri Lanka.

Further, considering the technology adoption in the higher education context, many more useful moderating effects other than age, gender, experience and common subject stream may be significant (see Chapter Four for more factors). Moderating effects specific to the Sri Lankan context could be incorporated to the model with a bigger sample size to well describe the ICT use and acceptance behavior.

Since the current study was conducted in Sri Lanka, further expansion and comparison involving university students outside Sri Lanka, with differing ICT uses, methods, different ICT tools, and other education levels can be conducted.

Though the results of this study were compared with the results of other studies conducted in different countries, these results are very specific to university students in Sri Lanka. Hence, there is space for additional and further investigations.

It was found that the individual culture had a significant influence on ICT use and acceptance. This would give rise to another path of comparative research that could help universities understand national cultural differences pertaining to ICT use and acceptance behavior. Comparing the results with other cultural contexts (countries) may be relevant, useful and valuable for the universities and countries too.

The current study employed a unique methodology specific to the research problem for the study. Therefore, it is a very significant contribution to the relevant body of knowledge. This methodology could be used for further research studies to examine its strength making generalizations in different contexts.

## **8.7 SUMMARY**

This chapter linked research objectives to the key findings of the study along with the research limitations and implications. Methodological contributions and practical contributions identified as specific to the use and acceptance of ICTs in the university context, it is argued, are useful for future researchers.

The model developed (ICTUAM) was finalized with an excellent model fit and it describes the current use behavior and the intention to the future use of ICTs by university students in Sri Lanka. Performance expectancy and facilitating conditions are the determinants which describe the current ICT use behavior. Further, the performance expectancy, effort expectancy, social influence and current use behavior all play important roles in determining the behavior intention to future use of ICTs.

Masculinity/femininity has a significant moderating effect on the relationship between performance expectancy and current use behavior. Power distance was seen to moderate the relationship between performance expectancy and the behavior intention to future use of ICTs. The relationship between the social influence and behavior intention to future use of ICTs is moderated by the common subject stream, masculinity/femininity, individualism/collectivism and uncertainty avoidance. Individualism/collectivism has a significant moderating effect on the relationship between effort expectancy and behavior intention to future use of ICTs.

However, the core findings and the model developed (ICTUAM) under this study provide crucial information not only to the universities in Sri Lanka but also at the national level.

## BIBLIOGRAPHY

- Aggestam, J., & Hallberg, A. (2004). *Unemployment in Sri Lanka: Explanations, constraints and prospects for the future* (Bachelor thesis). Lund University, School of Economics and Management. Retrieved from <http://lup.lub.lu.se/luur/download?func=downloadFile&recordOid=1337285&fileOid=1646423>
- Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. In P. D. J. Kuhl & D. J. Beckmann (Eds.), *Action Control* (pp. 11–39). Springer Berlin Heidelberg. Retrieved from <http://search.epnet.com/login.aspx?direct=true&db=aph&authdb=epref&an=ACFCB.AJZEN.SPRINGER.AIHE.AA>
- Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50(2), 179–211.
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888–918. doi:10.1037/0033-2909.84.5.888
- Akaike, H. (1974). A new look at the statistical model identification. *IEEE Transactions on Automatic Control*, 19(6), 716–723. doi:10.1109/TAC.1974.1100705
- Al-Gahtani, S. (2001). The applicability of TAM outside North America: An empirical test in the United Kingdom. *Inf. Resour. Manage. J.*, 14(3), 37–46. doi:10.4018/irmj.2001070104
- Ali, M., Brooks, L., Alshawi, S., & Papazafeiropoulou, A. (2006). Cultural dimensions and CRM systems implementation: A preliminary framework. AMCIS. Retrieved from <http://bura.brunel.ac.uk/handle/2438/1877>
- Al-Qeisi, K. I. (2009). *Analyzing the use of UTAUT model in explaining an online behaviour: Internet banking adoption* (Thesis). Brunel University Brunel Business School PhD Theses. Retrieved from <http://bura.brunel.ac.uk/handle/2438/3620>
- Amarasinghe, A. (2012). 11.8% Internet Penetration? Is This Really Enough? Retrieved from <http://www.amisampath.com/2012/02/118-internet-penetration-is-this-really.html>
- American heritage dictionary of the english language. (2013). Retrieved February 2, 2013, from <https://www.ahdictionary.com/>
- Amichai-Hamburger, Y., & Vinitzky, G. (2010). Social network use and personality. *Computers in Human Behavior*, 26(6), 1289–1295. doi:10.1016/j.chb.2010.03.018

- Anandarajan, M., Igbaria, M., & Anakwe, U. P. (2000). Technology acceptance in the banking industry. *Information Technology & People, 13*(4), 298–312.  
doi:10.1108/09593840010359491
- Anderson, P. F. (1983). Marketing, scientific progress, and scientific method. *Journal of Marketing, 47*(4), 18–31. doi:10.2307/1251395
- Arbuckle, J. (2007). *Amos 16.0 User's Guide*. Marketing Department, SPSS Incorporated.
- Archer, W., Anderson, T., & Garrison, R. (1999). Adopting disruptive technologies in traditional universities: Continuing education as an incubator for innovation. *Canadian Journal of University Continuing Education, 25*(1), 13–30.
- Aryasinha, R. (2002). The internet in South Asia: Opportunities and challenges. *Daily News, Associated Newspapers of Ceylon Ltd.*, Colombo. Retrieved from <http://archives.dailynews.lk/2002/01/30/fea09.html>
- Aturupane, H. (2008). Celebrating 60 years of educational progress and challenges in education in Sri Lanka. Presented at the 60'th Anniversary Celebrations of Sri Lanka, Westminster, London: Council for education in the commonwealth. Retrieved from <http://www.cecomm.org.uk/resources/reports-a-conferences/126-celebrating-60-years-of-educational-progress-and-challenges-in-education-in-sri-lanka>
- Avci, U., & Askar, P. (2012). The Comparison of the opinions of the university students on the usage of blog and wiki for their courses. *Educational Technology & Society, 15*(2), 194–205.
- Ayele, A. A., & Sreenivasarao, V. (2013). A case study of acceptance and use of electronic library services in universities based on SO-UTAUT model. *International Journal of Innovative Research in Computer and Communication Engineering, 1*(4), 903–911.
- Bagozzi, R. P., Wong, N., Abe, S., & Bergami, M. (2000). Cultural and situational contingencies and the theory of reasoned action: Application to fast food restaurant consumption. *Journal of Consumer Psychology, 9*(2), 97–106. doi:10.1207/S15327663JCP0902\_4
- Baker, W. (2001). A national survey of the Vermont visitor 2000: Outdoor recreation supplement. Retrieved February 13, 2011, from <http://www.uakron.edu/cba/cba-home/about-us/directory/profile.dot?identity=1198240>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. doi:10.1037/0033-295X.84.2.191
- Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Prentice-Hall.

- Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences*, 42(5), 815–824. doi:10.1016/j.paid.2006.09.018
- Basar, S. (2012). Factors influencing continuance intention to use student portal among university college Shahputra's students. *Asian Forum on Business Education*, 5(3), 275–291.
- Benbasat, I., & Barki, H. (2007). Quo vadis TAM? *Journal of the Association for Information Systems*, 8(4). Retrieved from <http://aisel.aisnet.org/jais/vol8/iss4/16>
- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588–606. doi:10.1037/0033-2909.88.3.588
- Beynon-Davies, P. (2002). *Information systems: An introduction to informatics in organisations*. Basingstoke: Palgrave Macmillan.
- Bhattacharjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly*, 25(3), 351–370. doi:10.2307/3250921
- Bhattacharjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test. *MIS Quarterly*, 28(2), 229–254.
- Biasutti, M., & EL-Deghaidy, H. (2012). Using wiki in teacher education: impact on knowledge management processes and student satisfaction. *Computers & Education*, 59(3), 861–872. doi:10.1016/j.compedu.2012.04.009
- Blurton, C. (1999). *New directions of ICT-use in education* (Communication and Information) (p. 51). UNESCO. Retrieved from <http://www.unesco.org/education/educprog/lwf/dl/edict.pdf>
- Bollen, K. A. (1989). *Structural equations with latent variables*. New York: Wiley-Interscience.
- Bond, R., & Smith, P. B. (1996). Culture and conformity: A meta-analysis of studies using Asch's. *Psychol Bull*, 111–137.
- Brown, S., Dennis, A., & Venkatesh, V. (2010). Predicting collaboration technology use: Integrating technology adoption and collaboration research. *J. Manage. Inf. Syst.*, 27(2), 9–54. doi:10.2753/MIS0742-1222270201
- Buarki, H. J. (2010). *Towards an improvement of LIS graduates ICT skills and employability needs in Kuwait* (Thesis). Loughborough University, Loughborough, Leicestershire, UK. Retrieved from <https://dspace.lboro.ac.uk/dspace-jspui/handle/2134/6339>
- Burch, T. K. (2003). Demography in a new key: A theory of population theory. *Demographic Research*, 9(11), 263–284. doi:10.4054/DemRes.2003.9.11

- Byrne, B. M. (1998). *Structural equation modeling with lisrel, prelis, and simplis: Basic concepts, applications, and programming*. Mahwah, N.J: Psychology Press.
- Byrne, B. M. (2001). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Mahwah, New Jersey, USA: Taylor & Francis.
- Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming* (2nd ed.). Mahwah, New Jersey, USA: Lawrence Erlbaum Associates.
- Cardon, P. W., & Marshall, B. A. (2008). National culture and technology acceptance: The impact of uncertainty avoidance. *Issues In Information Systems*, 2, 103–110.
- Carson, D. J., Gilmore, A., Perry, C., & Gronhaug, K. (2001). *Qualitative Marketing Research*. London ; Thousand Oaks, Calif: SAGE Publications Ltd.
- Central Bank. (2009). *The towers of learning: Performance, peril and promise of higher education in Sri Lanka* (Central Bank Report). Colombo: The World Bank Colombo Office. Retrieved from <http://siteresources.worldbank.org/SOUTHASIAEXT/Resources/Publications/TOLreportfinal.pdf>
- Central Bank. (2010). *Central bank of Sri Lanka annual report 2010* (Annual Report). Colombo: Central Bank of Sri Lanka. Retrieved from [http://www.cbsl.gov.lk/pics\\_n\\_docs/10\\_pub/\\_docs/efr/annual\\_report/AR2010/English/content.htm](http://www.cbsl.gov.lk/pics_n_docs/10_pub/_docs/efr/annual_report/AR2010/English/content.htm)
- Chang, N., Chiang, C., & Hopkinson, A. (2013). A Study of user acceptance using google software as a service (Saas). In *International Conference on Computer, Networks and Communication Engineering (ICCNCE 2013)*. Atlantis Press.  
doi:10.2991/iccnce.2013.18
- Chen, J. L. (2011). The effects of education compatibility and technological expectancy on e-learning acceptance. *Computers & Education*, 57(2), 1501–1511.  
doi:10.1016/j.compedu.2011.02.009
- Chou, S. W., & Liu, C.-H. (2005). Learning effectiveness in a web-based virtual learning environment: a learner control perspective. *Journal of Computer Assisted Learning*, 21(1), 65–76. doi:10.1111/j.1365-2729.2005.00114.x
- Christine Greenhow. (2011). Online social networks and learning. *On the Horizon*, 19(1), 4–12.  
doi:10.1108/107481211111107663
- Cohen, L., Manion, L., & Morrison, K. (2000). *Research methods in education* (5th ed.). London ; New York: RoutledgeFalmer.

- Colley, A., & Comber, C. (2003). Age and gender differences in computer use and attitudes among secondary school students: What has changed? *Educational Research*, 45(2), 155–165. doi:10.1080/0013188032000103235
- Collis, B. (1999). Designing for differences: Cultural issues in the design of WWW-based course-support sites. *British Journal of Educational Technology*, 30(3), 201–215. doi:10.1111/1467-8535.00110
- Combes, B. (2009). Generation Y: Are they really digital natives or more like digital refugees? *Synergy*, 7(1), 31–40.
- Compeau, D. R., & Higgins, C. A. (1991). A social cognitive theory perspective on individual reactions to computing technology. In *Proceedings of the Twelfth International Conference on Information Systems* (pp. 187–198). Minneapolis, MN, USA: University of Minnesota. Retrieved from <http://dl.acm.org/citation.cfm?id=126686.150733>
- Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19(2), 189–211. doi:10.2307/249688
- Conole, G., & Alevizou, P. (2010). *A literature review of the use of web 2.0 tools in higher education* (A report commissioned by the Higher Education Acade). Walton Hall, Milton Keynes, UK: The Open University. Retrieved from [http://www.heacademy.ac.uk/assets/EvidenceNet/Conole\\_Alevizou\\_2010.pdf](http://www.heacademy.ac.uk/assets/EvidenceNet/Conole_Alevizou_2010.pdf)
- Conole, G., De Laat, M., Dillon, T., & Darby, J. (2008). “Disruptive technologies”, “pedagogical innovation”: What’s new? findings from an in-depth study of students’ use and perception of technology. *Computers & Education*, 50(2), 511–524. doi:10.1016/j.compedu.2007.09.009
- Cooper, D. R. (2008). *Business research methods* (10th ed.). Boston: McGraw-Hill.
- Country plan for ICT education in Sri Lanka*. (2007). Presented at the ICT for education Leaders: from vision to reality international forum, Seoul Korea. Retrieved from <http://info.worldbank.org/etools/docs/library/243150/day5Sri%20Lanka.pdf>
- Cox, B. G. (2008). Target population. Retrieved March 11, 2011, from <http://srmo.sagepub.com/view/encyclopedia-of-survey-research-methods/n571.xml>
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. doi:10.1007/BF02310555
- Crossan, F. (2003). Research philosophy: Towards an understanding. *Nurse Researcher*, 11(1), 46–55. doi:10.7748/nr2003.10.11.1.46.c5914
- David, M., & Sutton, C. (2004). *Social research: The basics*. London ; Thousand Oaks: SAGE Publications Ltd.



- Davies, M. W. (1988). Women clerical workers and the typewriter: The writing machine. In C. Kramarae (Ed.), *Technology and women's voices: keeping in touch*. New York: Routledge.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. doi:10.2307/249008
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, 35(8), 982–1003.
- Davis, S. F., Grover, C. A., Becker, A. H., & McGregor, L. N. (1992). Academic Dishonesty: Prevalence, Determinants, Techniques, and Punishments. *Teaching of Psychology*, 19(1), 16–20. doi:10.1207/s15328023top1901\_3
- Day, D. (2006). Cultural aspects of user interface acceptance. In *International encyclopedia of ergonomics and human factors* (Vol. 1, pp. 1067–1070).
- Department of National Planning. (2010). The Emerging Wonder of Asia Mahinda Chinthana - Vision for the Future: The Development Policy Framework Government of Sri Lanka. Ministry of Finance and Planning, Sri Lanka.
- Dewey, J. (1943). *The child and the curriculum; The school and society*. Chicago: University of Chicago Press.
- De Wit, K., Heerwegh, D., & Verhoeven, J. C. (2011). Changes in the basic ICT skills of freshmen between 2005 and 2009: Who's catching up and who's still behind? *Education and Information Technologies*, 17(2), 205–231. doi:10.1007/s10639-011-9154-z
- Diamantopoulos, A., & Schlegelmilch, B. (1997). *Taking the fear out of data analysis*. London: Cengage Learning EMEA.
- Diamantopoulos, A., & Siguaw, J. A. (2000). *Introducing LISREL: A Guide for the Uninitiated*. SAGE.
- Dillon, A., & Morris, M. (2006). User acceptance of information technology: Theories and models. *Annual Review of Information Science and Technology*, 31, 3–32.
- Dillon, A., & Morris, M. G. (1996). User acceptance of information technology: Theories and models. *Annual Review of Information Science and Technology (ARIST)*, 31, 3–32.
- Dougherty, J. P., Dececchi, T., Clear, T., Richards, B., Cooper, S., & Wilusz, T. (2002). Information technology fluency in practice. In *Working Group Reports from ITiCSE on Innovation and Technology in Computer Science Education* (pp. 153–171). New York, NY, USA: ACM. doi:10.1145/782941.782999
- Dulle, W. F. (2010). *An analysis of open access scholarly communication Tanzanian public universities* (Thesis). Retrieved from <http://uir.unisa.ac.za/handle/10500/3684>

- Dutta, S., & Mia, I. (2011). *The global information technology report 2010-2011* (p. 435). World Economic Forum. Retrieved from <http://www.weforum.org/reports/global-information-technology-report-2010-2011-0>
- Dwivedi, Y., Williams, M., Lal, B., & Schwartz, A. (2008). Profiling adoption, acceptance and diffusion research in the information systems discipline. In *Proceedings of the 16th. European Conference on Information Systems* (pp. 1204–1215). Ireland. Retrieved from <http://aisel.aisnet.org/ecis2008/112/>
- Easterby-Smith, M., Thorpe, R., Jackson, P., & Lowe, A. (2008). *Management research*. London: Sage Publications.
- Ebner, M., Lienhardt, C., Rohs, M., & Meyer, I. (2010). Microblogs in higher education – a chance to facilitate informal and process-oriented learning? *Computers & Education*, 55(1), 92–100. doi:10.1016/j.compedu.2009.12.006
- Edirisuriya, M. (2006). *The sustainability of ICT education in Sri Lanka*. University of Moratuwa, Moratuwa. Retrieved from <http://dl.lib.mrt.ac.lk/handle/123/466>
- El-Gayar, O. F., & Moran, M. (2006). College students' acceptance of tablet PCs: An application of the UTAUT model. In *In Annual meeting of the decision sciences institute conference proceedings* (Vol. 2845–2850).
- Ellis, C. (2001). *Innovation in education: The increasing digital world—issues of today and tomorrow*. Presented at the National IT Workforce Convocation of the Information Technology Association of America, San Diego, California. Retrieved from <http://www.intel.com/education/community/contribution>
- Escobar-Rodriguez, T., Carvajal-Trujillo, E., & Monge-Lozano, P. (2013). Factors that drive students to use Facebook as a learning tool: An extension of the UTAUT. Retrieved from <http://www.ugr.es/~dbuendia/IX%20Jornada%20de%20Docencia.pdf>
- Fary, B. A. (1984). Computer literacy for staff development. *AEDS Journal*, 17(4), 1–8. doi:10.1080/00011037.1984.11008372
- Festinger, L. A. (1957). *Theory of cognitive dissonance*. Evanston, IL: Row and Peterson.
- Field, A. (2005). Project 2: Design a questionnaire. Retrieved from <http://www.statisticshell.com/project2.pdf>
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: an introduction to theory and research*. Reading, Mass: Addison-Wesley Pub.
- Forbes, D. A., King, K. M., Kushner, K. E., Letourneau, N. L., Myrick, A. F., & Profetto-McGrath, J. (1999). Warrantable evidence in nursing science. *Journal of Advanced Nursing*, 29(2), 373–379.

- Gable, G. G. (1994). Integrating case study and survey research methods: An example in information systems. *European Journal of Information Systems*, 3(2), 112–126.
- Garrido, M., Sullivan, J., Gordon, A., & Coward, C. (2009). *Researching the links between ICT skills and employability: An analytical framework* (CIS Working Paper No. 4). Seattle, WA 98195 USA: Center for Information & Society (CIS), University of Washington. Retrieved from [www.cis.washington.edu/employability](http://www.cis.washington.edu/employability)
- Gay, G., Mahon, S., Devonish, D., Alleyne, P., & Alleyne, P. (2006). Perceptions of information and communication technology among undergraduate management students in Barbados. *International Journal of Education and Development Using ICT*, 2(4). Retrieved from <http://ijedict.dec.uwi.edu/viewarticle.php?id=223&layout=html>
- Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of E-Mail: An extension to the technology acceptance model. *MIS Quarterly*, 21(4), 389–400. doi:10.2307/249720
- Gill, J., & Johnson, P. (2002). *Research methods for managers*. London: SAGE.
- Godamanna, E. H., & Jayamaha, A. (2013). Information and communication technology facilitated education in national universities of Sri Lanka. *Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 4(5), 726–732.
- Gogus, A., Nistor, N., Riley, R. W., & Lerche, T. (2012). Educational Technology Acceptance across Cultures: A validation of the unified theory of acceptance and use of technology in the context of Turkish national culture. *Turkish Online Journal of Educational Technology - TOJET*, 11(4), 394–408.
- Goodhue, D. L. (1995). Understanding user evaluations of information systems. *Management Science*, 41(12), 1827–1844.
- Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly*, 19(2), 213–236. doi:10.2307/249689
- Gray, R. (2004). No longer a man: Using ethnographic fiction to represent life history research. *Auto/biography*, 12(1), 44–61. doi:10.1191/0967550704ab005oa
- Gronland, M. (2010). *User acceptance of information technology: An empirical study of it's learning*. Norwegian University of Science and Technology, Norwegian. Retrieved from <http://ntnu.diva-portal.org/smash/get/diva2:349980/FULLTEXT01>
- Gruzd, A., Staves, K., & Wilk, A. (2012). Connected scholars: Examining the role of social media in research practices of faculty using the UTAUT model. *Computers in Human Behavior*, 28(6), 2340–2350. doi:10.1016/j.chb.2012.07.004

- Gunawardana, K. D. (2005). An empirical study of potential challenges and benefits of implementing e-learning in Sri Lanka. In *Proceedings of the Second International Conference on eLearning for Knowledge-Based Society* (Vol. 33, pp. 1–8). Bangkok, Thailand. Retrieved from <http://www.journal.au.edu/ijcim/2005/specialaug05/PP33.pdf>
- Hair, J. F., Tatham, R. L., Anderson, R. E., & Black, W. (1998). *Multivariate data analysis* (5th ed.). Upper Saddle River, N.J: Prentice Hall.
- Hair, J. J., Black, W. C., Babin, B. J., Anderson, R. E., & Tatman, R. L. (2006). *Multivariate data analysis* (6th ed.). New Jersey: Prentice Hall.
- Han, S. (2003). *Individual adoption of information systems in organisations: A literature review of technology acceptance model* (Technical Report No. 540). TUCS. Retrieved from [http://www.google.lk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Ftucs.fi%2Fpublications%2Fattachment.php%3Ffname%3DTR540.pdf&ei=w0e2VOLmB46LuwTMhoKQCw&usg=AFQjCNE3aqKMPLQ-rj07OHAAct2TIDl4Y\\_Q&bvm=bv.83640239,d.c2E](http://www.google.lk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCEQFjAA&url=http%3A%2F%2Ftucs.fi%2Fpublications%2Fattachment.php%3Ffname%3DTR540.pdf&ei=w0e2VOLmB46LuwTMhoKQCw&usg=AFQjCNE3aqKMPLQ-rj07OHAAct2TIDl4Y_Q&bvm=bv.83640239,d.c2E)
- Herath, H. M. T. S., & Ranasinghe, A. (2011). Labour market prospects for business graduates in Sri Lanka. *International Journal of Social Science and Humanity*, 1(1), 26–30.
- Hewagamage, K. P. (2009). *Information Technology proficiency of undergraduates in higher education institutes in Sri Lanka* (Final report). University of Colombo School of Computing (UCSC).
- Hewagamage, K. P. (2013). *Expected ICT Literacy & Professional Levels*. Lecture Note. Retrieved from [http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.ruh.ac.lk%2FUni%2Fhetc%2FUDG%2520-%2520Training%2520Materials%2FPresentations%2FLec%25203.%2520Expected%2520IT%2520Proficiency%2520Levels%2520by%2520Dr.%2520KPH.ppt&ei=kmbpVM\\_AOcyLuwSMqoHICA&usg=AFQjCNFQV7mFq1rcNB0anjAwIeAK3kquog&bvm=bv.86475890,d.c2E](http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.ruh.ac.lk%2FUni%2Fhetc%2FUDG%2520-%2520Training%2520Materials%2FPresentations%2FLec%25203.%2520Expected%2520IT%2520Proficiency%2520Levels%2520by%2520Dr.%2520KPH.ppt&ei=kmbpVM_AOcyLuwSMqoHICA&usg=AFQjCNFQV7mFq1rcNB0anjAwIeAK3kquog&bvm=bv.86475890,d.c2E)
- Higher education for twenty first century project. (2014). Outline of the areas covered in the UCTIT exam. Ministry of higher education. Retrieved from [http://www.hetc.lk/exams/documents/uctit\\_details\\_students.pdf](http://www.hetc.lk/exams/documents/uctit_details_students.pdf)
- Hilberg, J. S., & Meiselwitz, G. (2008). Undergraduate fluency with information and communication technology: Perceptions and reality. In *Proceedings of the 9th ACM SIGITE*

*Conference on Information Technology Education* (pp. 5–10). New York, NY, USA: ACM.  
doi:10.1145/1414558.1414562

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values* (Abridged edition). Beverly Hills: SAGE Publications, Inc.

Hofstede, G. (2001). *Culture's consequences: comparing values, behaviors, institutions and organizations across nations* (2nd edition). Thousand Oaks, Calif.: SAGE Publications, Inc.

Hofstede, G. (2008). *Cultural differences in teaching and learning*. Presentation slides presented at the FUHU conference on education and training in the multicultural classroom copenhagen. Retrieved from [http://www.FBE\\_geert\\_hofstede\\_teaching\\_learning-1.pdf](http://www.FBE_geert_hofstede_teaching_learning-1.pdf)

Hofstede, G., & Bond, M. H. (1988). The confucius connection: From cultural roots to economic growth. *Organizational Dynamics*, 16(4), 5–21. doi:10.1016/0090-2616(88)90009-5

Hofstede, G. H. (1997). *Cultures and organizations: software of the mind*. McGraw-Hill.

Hofstede, G., & McCrae, R. R. (2004). Personality and culture revisited: Linking traits and dimensions of culture. *Cross-Cultural Research*, 38(1), 52–88.  
doi:10.1177/1069397103259443

Holmes, B. (1998). *Cross-cultural differences of use of information technology in education: A comparative study of the use of computers in Japanese and British classrooms*. University of Cambridge, Wolfson College.

Holmes-Smith, C. E., & Coote, L. (2006). *Structural equation modeling: From the fundamentals to advanced topics*. School Research, Evaluation and Measurement Services.

Holmes-Smith, P. (2000). *Introduction to structural equation modelling using AMOS 4.0: Course notes*. Melbourne: SREAMS.

Hsu, M. H., Chiu, C. M., & Ju, T. L. (2004). Determinants of continued use of the WWW: An integration of two theoretical models. *Industrial Management & Data Systems*, 104(9), 766–775. doi:10.1108/02635570410567757

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55. doi:10.1080/10705519909540118

Hussey, J., & Hussey, R. (1997). *Business research: A practical guide for undergraduate and postgraduate students*. Basingstoke, Hampshire: Macmillan Business.

ICT market analysis. (2008). Retrieved August 7, 2010, from  
<http://www.marketsmonitor.com/Market-Research/IT.html>

- Im, I., Hong, S., & Kang, M. S. (2011). An international comparison of technology adoption: Testing the UTAUT model. *Information & Management*, 48(1), 1–8.  
doi:10.1016/j.im.2010.09.001
- Internet world stats: Usage and population statistics. (2011). Internet world stats. Retrieved from <http://www.internetworldstats.com/asia/lk.htm>
- Ito, M., Antin, J., Finn, M., Law, A., Manion, A., Mitnick, S., ... Horst, H. A. (2009). *Hanging out, messing around, and geeking out: Kids living and learning with new media*. MIT Press.
- Jayasundara, C. C. (2009). *Developing a model for predicting customer satisfaction in relation to service quality in university libraries in Sri Lanka* (Thesis). University of South Africa, South Africa. Retrieved from <http://archive.cmb.ac.lk/research/handle/70130/169>
- Jing, Z., Jinghua, H., & Junquan, C. (2010). Empirical research on user acceptance of mobile searches. *Tsinghua Science and Technology*, 15(2), 235–245. doi:10.1016/S1007-0214(10)70056-0
- Johnson, L., Levine, A., & Smith, R. (2009). *The Horizon Report: new media consortium and EDUCAUSE learning initiative*. NMC. Retrieved from <http://www.nmc.org/pdf/2009-Horizon-Report.pdf>
- Jones, C., Ramanau, R., Cross, S., & Healing, G. (2010). Net generation or digital natives: Is there a distinct new generation entering university? *Computers & Education*, 54(3), 722–732. doi:10.1016/j.compedu.2009.09.022
- Jones, C., & Shao, B. (2011). The net generation and digital natives: implications for higher education [Other]. Retrieved February 12, 2012, from <http://www.heacademy.ac.uk/resources/detail/evidencenet/net-generation-and-digital-natives>
- Jöreskog, K. G., & Sörbom, D. (1996). *LISREL 8: User's reference guide*. Scientific Software International.
- Kahn, R. L., & Cannell, C. F. (1957). *The dynamics of interviewing: Theory, technique, and cases*. New York: Wiley.
- Kaminiski, K., Seel, P., & Cullen, K. (2003). Technology literate students: a survey of freshman students at Colorado State university measured their self-determined ability to use technology. *EDUCAUSE Quarterly*, 3, 34–40.
- Kaminski, K., Switzer, J., & Gloeckner, G. (2009). Workforce readiness: A study of university students' fluency with information technology. *Computers & Education*, 53(2), 228–233. doi:10.1016/j.compedu.2009.01.017

- Kasse, J. P., & Balunywa, W. (2013). An assessment of e-learning utilization by a section of Ugandan universities: Challenges, success factors and way forward. In *Proceedings of the International Conference on ICT for Africa 2013*. Harare, Zimbabwe.
- Kennedy, G., Dalgarno, B., Gray, K., Judd, T., Waycott, J., Bennett, S., ... Churchwood, A. (2007). The net generation are not big users of web 2.0 technologies: Preliminary findings. *Faculty of Education - Papers (Archive)*, 517–525.
- Kennedy, G. E., Judd, T. S., Churchward, A., Gray, K., & Krause, K.-L. (2008). First year students' experiences with technology: are they really digital natives? *Australasian Journal of Educational Technology*, 24(1), 108–122.
- Kenny, D. A., & McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling*, 10(3), 333–351.  
doi:10.1207/S15328007SEM1003\_1
- Keynes, J. M. (1936). *The general theory of employment, interest, and money*. London: Macmillan. Retrieved from [http://ebooks.adelaide.edu.au/k/keynes/john\\_maynard/k44g/](http://ebooks.adelaide.edu.au/k/keynes/john_maynard/k44g/)
- Khalifa, M., & Liu, V. (2002). Explaining satisfaction at different stages of adoption in the context of internet-based services. In *ICIS 2002 Proceedings*. Barcelona, Spain, 15–18 December. Retrieved from <http://aisel.aisnet.org/icis2002/14>
- King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, 43(6), 740–755. doi:10.1016/j.im.2006.05.003
- Klamma, R., Chatti, M. A., Duval, E., Hummel, H., Hvannberg, E. T., Kravcik, M., ... Scott, P. (2007). Social software for life-long learning. *Journal of Educational Technology & Society*, 10(3), 72–83.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Delhi: New Age International.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.  
doi:10.1177/001316447003000308
- Kremelberg, D. (2010). *Practical statistics: A quick and easy guide to IBM® SPSS® statistics, STATA, and other statistical software*. Los Angeles: SAGE Publications, Inc.
- Kripanont, N. (2007). *Examining a technology acceptance model of Internet usage by academics within Thai business schools* (phd). Victoria University. Retrieved from <http://www.vu.edu.au/research>
- Krueger, R. A., & Casey, M. A. (2000). *Focus groups: A practical guide for applied research*. Thousand Oaks: Sage.

- Kumpulainen, K. (2007). *Educational technology: Opportunities and challenges*. Oulu, Finland: University of Oulu. Retrieved from <http://herkules.oulu.fi/isbn9789514284069/isbn9789514284069.pdf>
- Lai, C., & Gu, M. (2011). Self-regulated out-of-class language learning with technology. *Computer Assisted Language Learning*, 24(4), 317–335. doi:10.1080/09588221.2011.568417
- Lankton, N., & McKnight, D. H. (2007). Using expectation disconfirmation theory to predict technology trust and usage continuance intentions. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.97.1921&rep=rep1&type=pdf>
- Layton, R. H. (1994). *Conflict in the archaeology of living traditions*. Taylor & Francis.
- Lee, A. C. K. (2003). Undergraduate students' gender differences in IT skills and attitudes. *Journal of Computer Assisted Learning*, 19(4), 488–500. doi:10.1046/j.0266-4909.2003.00052.x
- Legris, P., Ingham, J., & Colletette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, 40(3), 191–204. doi:10.1016/S0378-7206(01)00143-4
- Lei, J. (2010). Quantity versus quality: A new approach to examine the relationship between technology use and student outcomes. *British Journal of Educational Technology*, 41(3), 455–472. doi:10.1111/j.1467-8535.2009.00961.x
- Leonard-Barton, D., & Deschamps, I. (1988). Managerial influence in the implementation of new technology. *Management Science*, 34(10), 1252–1265. doi:10.1287/mnsc.34.10.1252
- Levin, D. M. (1988). *The opening of vision: Nihilism and the postmodern situation*. New York: Routledge.
- Lin, C. P., & Anol, B. (2008). Learning online social support: An investigation of network information technology based on UTAUT. *Cyberpsychology & Behavior: The Impact of the Internet, Multimedia and Virtual Reality on Behavior and Society*, 11(3), 268–272. doi:10.1089/cpb.2007.0057
- Li, N., & Kirkup, G. (2007). Gender and cultural differences in Internet use: A study of China and the UK. *Computers & Education*, 48(2), 301–317. doi:10.1016/j.compedu.2005.01.007
- Lin, P. C., Lu, H.-K., & Liu, S. C. (2013). Towards an education behavioral intention model for e-learning systems: An extension of UTAUT. *Journal of Theoretical & Applied Information Technology*, 47(3), 1120–1127.



- Lin, S., Zimmer, J. C., & Lee, V. (2013). Podcasting acceptance on campus: The differing perspectives of teachers and students. *Computers & Education*, 68, 416–428. doi:10.1016/j.compedu.2013.06.003
- Loch, K. D., Straub, D. W., & Kamel, S. (2003). Diffusing the Internet in the Arab world: The role of social norms and technological cultururation. *IEEE Transactions on Engineering Management*, 50(1), 45–63. doi:10.1109/TEM.2002.808257
- Losh, S. C. (2004). Gender, educational, and occupational digital gaps 1983-2002. *Social Science Computer Review*, 22(2), 152–166. doi:10.1177/0894439303262557
- Louho, R., Kallioja, M., & Oittinen, P. (2006). Factors affecting the use of hybrid media applications. *Graphic Arts in Finland*, 35(3), 11–21.
- Luckin, R., Clark, W., Graber, R., Logan, K., Mee, A., & Oliver, M. (2009). Do web 2.0 tools really open the door to learning? : Practices, perceptions and profiles of 11-16-year-old students. *Learning, Media and Technology*, 34(2), 87–104.
- Luu, K., & Freeman, J. G. (2011). An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada and Australia. *Computers & Education*, 56(4), 1072–1082. doi:10.1016/j.compedu.2010.11.008
- MacLeod, A., Tweedie, A., Welburn, S. C., Maudlin, I., Turner, C. M. R., & Tait, A. (2000). Minisatellite marker analysis of *Trypanosoma brucei*: Reconciliation of clonal, panmictic, and epidemic population genetic structures. *Proceedings of the National Academy of Sciences*, 97(24), 13442–13447. doi:10.1073/pnas.230434097
- Macleod, H., Denise, H., & Haywood, J. (2002). Gender & information & communications technology-A 10-year study of new undergraduates. *TechTrends*, 46(6), 11–15. doi:10.1007/BF02824154
- Madigan, E. M., Goodfellow, M., & Stone, J. A. (2007). Gender, perceptions, and reality: Technological literacy among first-year students. In *Proceedings of the 38th SIGCSE Technical Symposium on Computer Science Education* (pp. 410–414). New York, NY, USA: ACM. doi:10.1145/1227310.1227453
- Magee, A. (2002). Attitude-behaviour relationship. Retrieved April 12, 2011, from [http://www.ciadvertising.org/SA/fall\\_02/adv382j/mageeac/theory.htm](http://www.ciadvertising.org/SA/fall_02/adv382j/mageeac/theory.htm)
- Mahmood, K. (2009). Gender, subject and degree differences in university students' access, use and attitudes toward information and communication technology (ICT) [Non-Refereed Case Study]. Retrieved January 19, 2012, from <http://ijedict.dec.uwi.edu/viewarticle.php?id=704>

- Makrakis, V. (1992). Cross-cultural comparison of gender differences in attitude towards computers in Japan and Sweden. *Scandinavian Journal of Educational Research*, 36(4), 275–287. doi:10.1080/0031383920360403
- Mao, E., & Palvia, P. (2006). Testing an extended model of IT acceptance in the Chinese cultural context. *SIGMIS Database*, 37(2-3), 20–32. doi:10.1145/1161345.1161351
- Marchewka, J., Liu, C., & Kostiwa, K. (2007). An application of the UTAUT model for understanding student perceptions using course management software. *Communications of the IIMA*, 7(2), 93–104.
- Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. *Computers & Education*, 56(2), 429–440. doi:10.1016/j.compedu.2010.09.004
- Martins, L. L., & Kellermanns, F. W. (2004). A model of business school students' acceptance of a web-based course management system. *Academy of Management Learning & Education*, 3(1), 7–26.
- May, T. (2001). *Social research methods: Issues, methods and process* (3rd ed.). Buckingham: Open University Press.
- McCoy, S., Galletta, D. F., & King, W. R. (2007). Applying TAM across cultures: The need for caution. *European Journal of Information Systems*, 16(1), 81–90. doi:10.1057/palgrave.ejis.3000659
- Mcilroy, D., Sadler, C., & Boojawon, N. (2007). Computer phobia and computer self-efficacy: Their association with undergraduates' use of university computer facilities. *Computers in Human Behavior*, 23(3), 1285–1299. doi:10.1016/j.chb.2004.12.004
- Meyers-Levy, J. (1988). Factors affecting the use of conceptually driven and data driven processing. *Advances in Consumer Research*, 15, 169–173.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2nd ed.). Thousand Oaks: SAGE Publications, Inc.
- Ministry of Education. (2007). *Education sector development programme* (Final Report No. ADB TA 4733). Ministry of Education, Sri Lanka. Retrieved from <http://www.adb.org/sites/default/files/project-document/73211/39293-02-sri-dpta.pdf>
- Minocha, S. (2008). *A study on the effective use of social software by further and higher education in the UK to support student learning and engagement*. (JISC Final Report) (pp. 1–115). Retrieved from <http://www.jisc.ac.uk/media/documents/projects/effective-use-of-social-software-in-education-finalreport.pdf>

- Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2(3), 192–222. doi:10.1287/isre.2.3.192
- Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Dean, C. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, 105(3), 430–445. doi:10.1037/0033-2909.105.3.430
- Myers, M. D., & Tan, F. B. (2002). Beyond models of national culture in information systems research: *Journal of Global Information Management*, 10(1), 24–32. doi:10.4018/jgim.2002010103
- Nash, J. (2009). Computer skills of first-year students at a South African university. In *Proceedings of the 2009 Annual Conference of the Southern African Computer Lecturers' Association* (pp. 88–92). New York, NY, USA: ACM. doi:10.1145/1562741.1562752
- Nassuora, A. (2012). Students acceptance of mobile learning for higher education in Saudi Arabia. *American Academic & Scholarly Research Journal*, 4(2), 24–30.
- Ndunguru, P. C. (2007). Lectures on research methodology for social sciences. Research Information and Publications Department, Mzumbe University.
- Neuman, W. L. (2002). *Social research methods: Qualitative and quantitative approaches* (5 edition). Boston: Allyn & Bacon.
- Neuman, W. L. (2006). *Social research methods: qualitative and quantitative approaches* (6th ed.). Boston: Pearson Education, Inc.
- Nistor, N., Lerche, T., Weinberger, A., Ceobanu, C., & Heymann, O. (2012). Towards the integration of culture into the unified theory of acceptance and use of technology. *British Journal of Educational Technology*, 45(1), 36–55. doi:10.1111/j.1467-8535.2012.01383.x
- Nwabueze, S. N., Meso, P. N., Mbarika, V. W., Kifle, M., Okoli, C., & Chustz, M. (2009). The effects of culture of adoption of telemedicine in medically underserved communities. In *42nd Hawaii International Conference on System Sciences, 2009. HICSS '09* (pp. 1–10). doi:10.1109/HICSS.2009.430
- Obanya, P. (2009). *Dreaming, living and doing education*. Ibadan: Institute of Ibadan.
- Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*, 17(4), 460–469. doi:10.2307/3150499

- Onyango, R. A. O. (2002). Data collection instruments in information sciences. In L. O. Aina (Ed.), *Research in Information Sciences: An African Perspective*. Nigeria: Stirling-Horden Publishers (Nig.).
- O'Reilly, T. (2005). What Is web 2.0. Retrieved January 25, 2012, from <http://oreilly.com/web2/archive/what-is-web-20.html>
- Oshlyansky, L., Cairns, P., & Thimbleby, H. (2007). Validating the unified theory of acceptance and use of technology (UTAUT) tool cross-culturally. In *Proceedings of the 21st British HCI Group Annual Conference on People and Computers: HCI...But Not As We Know It - Volume 2* (pp. 83–86). Swinton, UK, UK: British Computer Society. Retrieved from <http://dl.acm.org/citation.cfm?id=1531407.1531429>
- Oye, N. D., A.Iahad, N., & Ab.Rahim, N. (2012). The history of UTAUT model and its impact on ICT acceptance and usage by academicians. *Education and Information Technologies*, 19(1), 251–270. doi:10.1007/s10639-012-9189-9
- Pajo, K., & Wallace, C. (2001). Barriers to the uptake of web-based technology by university teachers. *Journal of Distance Education*, 16(1), 70–84.
- Palagolla, W. W. N. C. K., & Wickramarachchi, A. P. R. (2009). Effective integration of ICT to facilitate the secondary education in Sri Lanka. In *Conference proceedings Accounting and management Information Systems*. Sri Lanka: Faculty of Management and Finance, University of Colombo.
- Pallant, J. (2005). SPSS survival manual: a step by step guide to data analysis using SPSS. Allen & Unwin, Crows Nest, NSW. Retrieved from [http://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS\\_Survival\\_Manual\\_Ver12.pdf](http://www.academia.dk/BiologiskAntropologi/Epidemiologi/PDF/SPSS_Survival_Manual_Ver12.pdf)
- Pardamean, B., & Susanto, M. (2012). Assessing user acceptance toward Blog technology: Using the UTAUT model. *International Journal of Mathematics and Computers in Simulation*, 6(1), 203–212.
- Park, S. Y., & Park, S. Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Educational Technology & Society*, 12(3), 150–162.
- Pasqual, A. (2009). SchoolNet – towards a next generation teaching/ learning platform. *Vidurawa*, 26(Special), 19–22.
- Philips, D. (1990). Post-positivistic science myths and realities. In E. Guba (Ed.), *The Paradigm dialog*. Newbury Park: Sage.

- Pouratashi, M., & Rezvanfar, A. (2010). Analysis of factors influencing application of ICT by agricultural graduate students. *J. Am. Soc. Inf. Sci. Technol.*, *61*(1), 81–87.  
doi:10.1002/asi.v61:1
- Rahman, A. L. A., Jamaludin, A., & Mahmud, Z. (2011). Intention to use digital library based on modified UTAUT model: Perspectives of Malaysian postgraduate students. *World Academy of Science, Engineering & Technology*, *5*(3), 96–103.
- Ramanayake, A., Jayamanne, I., Ramyadevipriya, Y., & Perera, K. . L. R. R. H. (2012). *Graduand Employment Census 2012* (pp. 1–71). Colombo: Ministry of Higher Education.
- Ranasinghe, A. L. (2004). ICT and decent work: an assessment of the labour market impacts of the advent of information and communication technology in Sri Lanka. Presented at the JILPT/ILO Networking of National Institutes for Labour Studies: Meeting on Joint Investigative Studies for "Determining the Impact of Information and Communications Technology on Decent Work in the Asia and Pacific Region. Retrieved from :[http://www.jil.go.jp/english/events\\_and\\_information/documents/ann04\\_sri\\_lanka.pdf](http://www.jil.go.jp/english/events_and_information/documents/ann04_sri_lanka.pdf)
- Reddi, U. V., & Sinha, V. (2004). *Sri Lanka: ICT use in education* (meta-survey report on the use of technologies in education 2003-2004). UNESCO. Retrieved from <http://unesdoc.unesco.org/images/0013/001349/134960e.pdf>
- Reinen, I. J., & Plomp, T. (1997). Information technology and gender equality: A contradiction in terminis? *Computers & Education*, *28*(2), 65–78. doi:10.1016/S0360-1315(97)00005-5
- Rekabdarkolaei, S. M., & Amuei, F. (2008). Evaluation of ICT literacy differences in trainee student teachers from the view of sexuality. *Campus-Wide Information Systems*, *25*(3), 176–188. doi:10.1108/10650740810886349
- Renaud, K., & van Biljon, J. (2008). Predicting technology acceptance and adoption by the elderly: A qualitative study. In *Proceedings of the 2008 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries: Riding the Wave of Technology* (pp. 210–219). New York, NY, USA: ACM. doi:10.1145/1456659.1456684
- Richardson, W. (2010). *Blogs, wikis, podcasts, and other powerful web tools for classrooms* (Third Edition edition). Thousand Oaks, Calif: Corwin.
- Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). Criteria for scale selection and evaluation. In *Measures of Personality and Social Psychological Attitudes*. 1-6: Gulf Professional Publishing.
- Robson, C. (2002). *Real world research* (2nd ed.). Oxford: Wiley.

- Röcker, C. (2010). Why traditional technology acceptance models won't work for future information technologies? *World Academy of Science, Engineering and Technology*, 65, 237–243.
- Rogers, E. M. (1983). *Diffusion of innovations* (3rd ed.). New York: The Free Press.
- Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.
- Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations: A cross-culture approach* (2nd ed.). New York: Free Press.
- Roscoe, J. T. (1975). *Fundamental research statistics for the behavioral sciences*. New York: Holt, Rinehart and Winston.
- Rose, G., & Straub, D. (1998). Predicting general IT use: Applying TAM to the Arabic world. *Journal of Global Information Management*, 6(3), 39–46. doi:10.4018/jgim.1998070104
- Rosen, P. A. (2005). *The effect of personal innovativeness on technology acceptance* (PhD Dissertation). Oklahoma State University. Retrieved from [https://shareok.org/bitstream/handle/11244/6811/Department%20of%20Management\\_21.pdf?sequence=1](https://shareok.org/bitstream/handle/11244/6811/Department%20of%20Management_21.pdf?sequence=1)
- Ruiz-Calleja, A., Vega-Gorgojo, G., Asensio-Pérez, J. I., Bote-Lorenzo, M. L., Gómez-Sánchez, E., & Alario-Hoyos, C. (2012). A linked data approach for the discovery of educational ICT tools in the web of data. *Computers & Education*, 59(3), 952–962. doi:10.1016/j.compedu.2012.04.005
- Samaradiwakara, G. D. M. N. (2010). *Freshmen and ICT literacy: An islandwide survey* (Research final report). University of Sri Jayewardenepura.
- Sanchez-Franco, M. J. (2010). WebCT – the quasimoderating effect of perceived affective quality on an extending technology acceptance model. *Computers & Education*, 54(1), 37–46. doi:10.1016/j.compedu.2009.07.005
- Sanchez-Franco, M. J., Martínez-López, F. J., & Martín-Velicia, F. A. (2009). Exploring the impact of individualism and uncertainty avoidance in web-based electronic learning: An empirical analysis in European higher education. *Computers & Education*, 52(3), 588–598. doi:10.1016/j.compedu.2008.11.006
- Santos-Feliscuzo, L. T., & Himang, C. M. (2011). Library periodical indexing software evaluation using unified theory of acceptance and use of technology. *Procedia - Social and Behavioral Sciences*, 25, 104–114. doi:10.1016/j.sbspro.2011.10.532
- Sarkar, S. (2012). The role of information and communication technology (ICT) in higher education for the 21st century. *The Science Probe*, 1(1), 30–41.

- Satharasinghe, A. J. (2004). Computer literacy of Sri Lanka. Retrieved from <http://www.statistics.gov.lk/cls2004/index.htm>
- Saunders, M. N. K., Thornhill, A., & Lewis, P. (2009). *Research methods for business students* (5th ed.). New York: Prentice Hall.
- Schaper, L. K., & Pervan, G. P. (2007). An investigation of factors affecting technology acceptance and use decisions by Australian allied health therapists. In *40th Annual Hawaii International Conference on System Sciences, 2007. HICSS 2007* (pp. 141–141). doi:10.1109/HICSS.2007.69
- Schaper, L., & Pervan, G. (2004). A model of information and communication technology acceptance and utilisation by occupational therapists. In *2004 IFIP International Conference on Decision Support Systems, 2004*. Retrieved from <http://dsslab.infotec.monash.edu.au/dss2004/proceedings/pdf/72-schaper-pervan.pdf>
- Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & Management, 44*(1), 90–103. doi:10.1016/j.im.2006.10.007
- Schwartz, S. H. (1994). Beyond individualism/collectivism: New cultural dimensions of values, 85–119.
- Sedek, M., Mahmud, R., Jalil, H. A., & Daud, S. M. (2012). Types and levels of ubiquitous technology use among ICT undergraduates. *Procedia - Social and Behavioral Sciences, 64*, 255–264. doi:10.1016/j.sbspro.2012.11.030
- Sekaran, U. (2000). *Research methods for business: A skill-building approach* (3rd ed.). Wiley.
- Sekaran, U. (2003). *Research methods for business: A skill building approach* (4th ed.). New York: Wiley.
- Selltiz, C., Wrightsman, L. S., & Cook, S. W. (1976). *Research Methods in Social Relations*. New York: Holt, Rinehart and Winston.
- Selwyn, N. (1997). Students' attitudes toward computers: Validation of a computer attitude scale for 16–19 education. *Computers & Education, 28*(1), 35–41. doi:10.1016/S0360-1315(96)00035-8
- Serenko, A., Turel, O., & Yol, S. (2006). Moderating roles of user demographics in the American customer satisfaction model within the context of mobile services. *Journal of Information Technology Management, 17*(4), 20–32.
- Shadish, W., Cook, T., & Campbell, D. (2002). *Statistical conclusion validity and internal validity: Experimental and quasi experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

- Sharma, S. (1995). *Applied multivariate techniques*. New York: Wiley.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research*, 15(3), 325–343.
- Shevlin, M., & Miles, J. N. V. (1998). Effects of sample size, model specification and factor loadings on the GFI in confirmatory factor analysis. *Personality and Individual Differences*, 25(1), 85–90. doi:10.1016/S0191-8869(98)00055-5
- Shu, W., & Chuang, Y.-H. (2011). The behavior of wiki users. *Social Behavior and Personality: An International Journal*, 39(6), 851–864.  
doi:http://dx.doi.org/10.2224/sbp.2011.39.6.851
- Singleton, R., Straits, B. C., & Straits, M. M. (1993). *Approaches to social research* (2nd ed.). New York: Oxford University Press.
- Srite, M., & Karahanna, E. (2006). The role of espoused national cultural values in technology acceptance. *MIS Quarterly*, 30(3), 679–704.
- Statistics Sri Lanka. (2009). *Computer literacy survey*. Sri Lanka: Department of Census and Statistics. Retrieved from  
[http://www.statistics.gov.lk/CLS/BuletinComputerLiteracy\\_2009.pdf](http://www.statistics.gov.lk/CLS/BuletinComputerLiteracy_2009.pdf)
- Stephan, P., Patrick, W., Milis, K., & Van Stee, E. (2009). Modeling educational technology acceptance and satisfaction. Presented at the EDULEARN09 International Conference on Education and New Learning Technologies, Convention Centre, Gran Hotel Princess Sofia (Barcelona), Spain. Retrieved from  
<https://lirias.kuleuven.be/handle/123456789/384296>
- Straub, D., & Burton-Jones, A. (2007). Veni, Vidi, Vici: Breaking the TAM Logjam. *Journal of the Association for Information Systems*, 8(4). Retrieved from  
<http://aisel.aisnet.org/jais/vol8/iss4/14>
- Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & Management*, 33(1), 1–11.  
doi:10.1016/S0378-7206(97)00026-8
- Straub, D., Loch, K., Evaristo, R., Karahanna, E., & Srite, M. (2002). Toward a theory-based measurement of culture. *Journal of Global Information Management*, 10(1), 13–23.  
doi:10.4018/jgim.2002010102
- Straub, D. W. (1994). The effect of culture on IT diffusion: e-mail and fax in Japan and the U.S. *Information Systems Research*, 5(1), 23–47.



- Strong, D. M., Dishaw, M. T., & Bandy, D. B. (2006). Extending task technology fit with computer self-efficacy. *SIGMIS Database*, 37(2-3), 96–107.  
doi:10.1145/1161345.1161358
- Šumak, B., Heričko, M., & Pušnik, M. (2011). A meta-analysis of e-learning technology acceptance: The role of user types and e-learning technology types. *Computers in Human Behavior*, 27(6), 2067–2077. doi:10.1016/j.chb.2011.08.005
- Suraweera, N., & Liew, C. L. (2011). E-learning in information management education in Sri Lanka. Presented at the 12th Annual Research Symposium, University of Kelaniya. Retrieved from <http://www.kln.ac.lk/uokr/ICBI2011/ICT%20210.pdf>
- Surry, D. W., & Ensminger, D. C. (2006). Facilitating the use of web based learning by higher education faculty. *British Journal of Educational Technology*, 36(2), 327–329.
- Surry, D. W., Ensminger, D. C., & Haab, M. (2005). A model for integrating instructional technology into higher education. *British Journal of Educational Technology*, 36(2), 327–329. doi:10.1111/j.1467-8535.2005.00461.x
- Sutton, R. E. (1991). Equity and computers in the schools: A decade of research. *Review of Educational Research*, 61(4), 475–503. doi:10.3102/00346543061004475
- Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. *Management Science*, 42(1), 85–92.
- Tabachnick, B. G., & Fidell, L. S. (2006). *Using multivariate statistics*. Needham Heights, MA, USA: Allyn & Bacon, Inc.
- Tanaka, J. S. (1993). Multifaceted conceptions of fit in structural equation models. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models*. SAGE Publications.
- Tan, P. J. B. (2013). Students' adoptions and attitudes towards electronic placement tests: a UTAUT analysis. *American Journal of Computer Technology and Application*, 1(1), 14–24.
- Tashakkori, A., & Teddlie, C. (Eds.). (2003). *Handbook of Mixed Methods in Social & Behavioral Research*. SAGE Publications.
- Taylor, S., & Todd, P. (1995). Assessing IT usage: The role of prior experience. *MIS Quarterly*, 19(4), 561–570. doi:10.2307/249633
- Teo, T., Lee, C. B., Chai, C. S., Wong, S. L., Teo, T., Lee, C. B., ... Wong, S. L. (2009). Assessing the intention to use technology among pre-service teachers in Singapore and Malaysia: A multigroup invariance analysis of the technology acceptance model (TAM). *Computers & Education*, 53(3), 1000–1009.

- Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, 15(1), 125–143. doi:10.2307/249443
- Thowfeek, M. H., & Jaafar, A. (2013). The influence of cultural factors on the adoption of e-learning: A reference to a public university in Sri Lanka. *Applied Mechanics and Materials*, 263-266, 3424–3434. doi:10.4028/www.scientific.net/AMM.263-266.3424
- Tibenderana, P. K. G., & Ogao, P. J. (2008). Acceptance and use of electronic library services in Ugandan universities. In *Proceedings of the 8th ACM/IEEE-CS Joint Conference on Digital Libraries* (pp. 323–332). New York, NY, USA: ACM. doi:10.1145/1378889.1378944
- Ticehurst, G. W., & Veal, A. J. (2000). *Business research methods: A managerial approach*. Longman.
- Tinio, V. L. (2002). *ICT in education*. Bangkok: UNDP-Asia Pacific development information programme (APDIP). Retrieved from <http://www.apdip.net/publications/iespprimers/eprimer-edu.pdf>
- Triandis, H. C. (1977). *Interpersonal behavior*. Brooks/Cole Pub. Co.
- Trompenaars, F., & Hampden-Turner, C. (1998). *Riding the waves of culture: Understanding cultural diversity in global business*. New York: McGraw Hill.
- Tyler, L. (2005). *ICT literacy: Equipping students to succeed in an information-rich, technology-based society* (An issue paper from Educational Testing Service). Retrieved from [http://www.ets.org/Media/Tests/ICT\\_Literacy/pdf/ICT\\_Equipping\\_Students\\_to\\_Succeed.pdf](http://www.ets.org/Media/Tests/ICT_Literacy/pdf/ICT_Equipping_Students_to_Succeed.pdf)
- Tyler, T. R., Allan, E., & Huo, Y. J. (2000). Cultural values and authority relations: The psychology of conflict resolution across cultures. *Psychology, Public Policy, and Law*, 6(4), 1138–1163. doi:10.1037/1076-8971.6.4.1138
- Umunadi, E. K. (2011). Perception of technical education students on the role of ICT in general studies programme (GSP) in university education. *International Journal of Academic Research in Business and Social Sciences*, 1(3), 190.
- UNESCO. (2009). UNESCO portal on higher education institutions. Education Institutions in Nigeria.
- University grant commission (UGC) statistics. (2013). Retrieved from <http://www.ugc.ac.lk/en/publications/1418-sri-lanka-university-statistics-2013.html>

- University grant commission (UGC) statistics*. (2011). Retrieved from <http://www.ugc.ac.lk/en/university-statistics-2012/898-sri-lanka-university-statistics-2011.html>
- University grant commission (UGC) statistics*. (2010). Retrieved from <http://www.ugc.ac.lk/en/statistics/university-statistics-2010.html>
- Usluel, Y. K., Askar, P., Bas, T., Usluel, Y. K., Askar, P., & Bas, T. (2008). A structural equation model for ICT usage in higher education. *Educational Technology & Society*, *11*(2), 262–273.
- Valentín, A., Mateos, P. M., González-Tablas, M. M., Pérez, L., López, E., & García, I. (2013). Motivation and learning strategies in the use of ICTs among university students. *Comput. Educ.*, *61*, 52–58. doi:10.1016/j.compedu.2012.09.008
- Van Biljon, J., & Kotzé, P. (2007). Modelling the factors that influence mobile phone adoption. In *Proceedings of the 2007 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists on IT Research in Developing Countries* (pp. 152–161). New York, NY, USA: ACM. doi:10.1145/1292491.1292509
- Van Braak, J. P. (2004). Domains and determinants of university students' self-perceived computer competence. *Computers & Education*, *43*(3), 299–312. doi:10.1016/j.compedu.2003.09.006
- Van Raaij, E. M., & Schepers, J. J. L. (2008). The acceptance and use of a virtual learning environment in China. *Computers & Education*, *50*(3), 838–852. doi:10.1016/j.compedu.2006.09.001
- Van Teijlingen, E. R., & Hundley, V. (2001). The importance of pilot studies. Retrieved from <http://aura.abdn.ac.uk/handle/2164/157>
- Veal, A. J. (2005). *Business research methods: a managerial approach* (2nd ed.). Frenchs Forest: Pearson Australia.
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. doi:10.1287/mnsc.46.2.186.11926
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478.
- Venkatesh, V., & Speier, C. (1999). Computer technology training in the workplace: A longitudinal investigation of the effect of mood. *Organizational Behavior and Human Decision Processes*, *79*(1), 1–28. doi:10.1006/obhd.1999.2837

- Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Q.*, *36*(1), 157–178.
- Verhoeven, J. C., Heerwegh, D., & De Wit, K. (2010). Information and communication technologies in the life of university freshmen: An analysis of change. *Computers & Education*, *55*(1), 53–66. doi:10.1016/j.compedu.2009.12.002
- Verhoeven, J. C., Heerwegh, D., & Wit, K. D. (2011). First year university students' self-perception of ICT skills: Do learning styles matter? *Education and Information Technologies*, *17*(1), 109–133. doi:10.1007/s10639-010-9149-1
- Vessey, I., Ramesh, V., & Glass, R. L. (2002). The classification (TR 107- 1), and CS (TR 112-1), SE (TR 105-1), and IS (TR 106-1). Retrieved from [www.indiana.edu/~isdept/research/workingpapers.html](http://www.indiana.edu/~isdept/research/workingpapers.html)
- Vihera, M. L., & Nurmela, J. (2001). Communication capability as an intrinsic determinant for information age. *Futures*, *33*(3–4), 245–265. doi:10.1016/S0016-3287(00)00070-7
- Volman, M., & Eck, E. van. (2001). Gender equity and information technology in education: The second decade. *Review of Educational Research*, *71*(4), 613–634.
- Voros, T., & Choudrie, J. (2011). Uncertainty avoidance and technology acceptance in emerging economies: A comparative study. In *Proceedings Annual Work shop of the AIS Special Interest Group for ICT Global Development*. Retrieved from <http://aisel.aisnet.org/cgi/viewcontent.cgi?article=1011&context=globdev2011>
- Waldman, M. (2003). Freshmen's use of library electronic resources and self-efficiency. *Information Research*, (8), 2.
- Walker, D. T. H. (1997). Choosing an appropriate research methodology for a particular research question. *Construction Management and Economics*, *15*(2), 149–159.
- Walliman, N. (2006). *Social research methods*. SAGE.
- Wang, Y. S., Wu, M. C., & Wang, H. Y. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, *40*(1), 92–118. doi:10.1111/j.1467-8535.2007.00809.x
- Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly*, *16*(2), 201–226. doi:10.2307/249576
- Webster, M. (2006). Definition of context. Merriam-Webster Online Dictionary. Retrieved from <http://www.webster.com/cgi-bin/dictionary?context>
- Weisstein, E. W. (2004). Kurtosis. Retrieved August 7, 2010, from <http://mathworld.wolfram.com/Kurtosis.html>

- Weligamage, S., & Siengthai, S. (2003). Employer needs and graduate skills: The gap between employer expectations and job expectations of Sri Lankan university graduates. Presented at the 9th International Conference on Sri Lanka Studies, Matara, Sri Lanka. Retrieved from <http://www.slageconr.net/slsnet/9thicsls/fullpapers/fullp029.pdf>
- Wheaton, B., Muthen, B., Alwin, D. F., & Summers, G. F. (1977). Assessing reliability and stability in panel models. *Sociological Methodology*, 8, 84–136.
- Wickramasinghe, V., & Perera, L. (2010). Graduates', university lecturers' and employers' perceptions towards employability skills. *Education + Training*, 52(3), 226–244. doi:10.1108/00400911011037355
- Wikramanayake, G. N., Hewagamage, K. P., Gamage, G. I., & Weerasinghe, A. R. (2007). Asia eBIT @ UCSC: Implementing the paradigm shift from teaching to learning through e-learning framework. In *Proceeding of the 25th National IT conference*. Colombo, Sri Lanka. Retrieved from <http://www.slideshare.net/wikramanayake/asia-ebit-ucsc-implementing-the-paradigm-shift-from-teaching-to-learning-through-elearning-framework>
- Williams, M. D., Rana, N. P., Dwivedi, Y. K., & Lal, B. (2011). Is UTAUT really used or just cited for the sake of it? A systematic review of citations of UTAUT's originating article. In *ECIS Proceedings* (p. 231). Retrieved from <http://aisel.aisnet.org/ecis2011/231/>
- Wills, M. J., El-Gayar, O. F., & Bennett, D. (2008). Examining healthcare professionals' acceptance of electronic medical records using UTAUT. *Issues in Information Systems (IIS)*, VOL IX, No. 2, IX(2). Retrieved from [http://iacis.org/iis/2008/S2008\\_1053.pdf](http://iacis.org/iis/2008/S2008_1053.pdf)
- World Bank. (1999). *Sri Lanka - A fresh look at unemployment* (No. 19609) (pp. 1–65). The World Bank. Retrieved from <http://documents.worldbank.org/curated/en/1999/08/440270/sri-lanka-fresh-look-unemployment>
- Wu, Y.-L., Tao, Y.-H., & Yang, P.-C. (2007). Using UTAUT to explore the behavior of 3G mobile communication users. In *2007 IEEE International Conference on Industrial Engineering and Engineering Management* (pp. 199–203). doi:10.1109/IEEM.2007.4419179
- Yin, R. K. (2003). *Case study research: Design and method* (3rd ed.). London: Sage.
- Yoo, S. J., & Huang, W. D. (2011). Comparison of web 2.0 technology acceptance level based on cultural differences. *Educational Technology & Society*, 14(4), 241–252.
- Young, J. R. (2011). 6 Top smart phone apps to improve teaching, research, and your life. *Technology*, 1–4.

- Yuen, A. H. K., Law, N., & Wong, K. C. (2003). ICT implementation and school leadership. *Journal of Educational Administration, 41*(2), 158–170.  
doi:10.1108/09578230310464666
- Zakour, A. (2008). Information Technology acceptance across cultures. In P. Zaphiris & C. S. Ang (Eds.), *Human Computer Interaction: Concepts, Methodologies, Tools, and Applications*. IGI Global Snippet.
- Žerovnik, A., Rugelj, J., & Šerbec, I. N. (2011). ICT supported environment for active learning. *EDULEARN11 Proceedings, 6252–6260*.
- Zhang, D., Zhao, J. L., Zhou, L., & Nunamaker, J. F., Jr. (2004). Can e-Learning replace classroom learning? *Commun. ACM, 47*(5), 75–79. doi:10.1145/986213.986216
- Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Comput. Hum. Behav., 26*(4), 760–767. doi:10.1016/j.chb.2010.01.013
- Zikmund, W. G. (2002). *Business research methods* (7th ed.). Mason, OH: Cengage Learning.
- Zoraini, W. A., Lim, T. S. K., & Tai-Kwan, W. (2009). Mobile learning initiative through SMS: A formative evaluation. *ASEAN Journal of Open and Distance Learning, 1*(1), 49–58.