# ATTITUDES TOWARDS COMPUTER USAGE AS PREDICTORS OF THE CLASSROOM INTEGRATION OF INFORMATION AND COMMUNICATION TECHNOLOGY AT A RURAL SOUTH AFRICAN UNIVERSITY

By

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## DECLARATION

I declare that the thesis hereby submitted by me for the Philosophiae Doctor degree in Higher Education Studies at the University of the Free State is my own independent work and has not previously been submitted by me at any other university/faculty. I furthermore cede copyright of the thesis to the University of the Free State.

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**RD Wario** **Date**

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## ABSTRACT

The aim of this research was to determine whether attitudes towards computer usage predict ICT integration in the classroom at the QwaQwa campus of the University of the Free State. Attitudes towards computer technology were operationalised by using the scores of Computer Anxiety Scale, Attitudes towards ICT Scale, the Perception of Computer Attributes Scale, Cultural Perception Scale and Computer Competence Scale. The effect of confounding variables (age, gender, ethnicity, educational level, teaching experience, and computer training history) was controlled by building them into the design and measuring their effect on the dependent variables (ICT integration). The empirical study was supported by literature related to ICT integration in the classroom. Various theoretical models including Rogers's Theory on Diffusion of Innovations (1995) and Ajzen and Fishbein's Theory of Reasoned Action (1980) were used to better understand the key factors affecting ICT integration into the classroom, as well as the academic staff's attitudes towards ICT integration in the classroom. The researcher followed a quantitative inferential research design to investigate the possible relationship between attitudes towards computer usage and ICT integration in the classroom. An adapted questionnaire was administered to all academic staff at QwaQwa campus of the UFS during the 2011-2013 academic years. A total of one hundred academic staff participated in the study. Descriptive and inferential analyses (full-model linear regression and Analysis of Covariance (ANCOVA) were used to assess the relationship between attitudes towards computer usage and ICT integration in the classroom. The results from the study did not show a significant relationship between computer anxiety and attitudes towards computer usage and ICT integration, but did indicate a moderate relationship between computer attributes, cultural perception and ICT integration. Computer competence was seen as the most influencing factor affecting ICT use in the classroom. Based on the findings, it was recommended that effective institutional support (in terms of providing opportunities to academic staff to master adequate skills and knowledge) is required to ease and promote ICT integration in the classroom. Given the recent introduction of technology on the QwaQwa campus of the University of the Free State, the institution should not only focus on providing computers for the academic staff and students alike, but also

foster a culture of acceptance of these tools amongst the academic staff and students. Academic staff needs to be assured that technology can make their teaching interesting, easier, more fun for them and the students, more motivating and more enjoyable.

**ABSTRAK**

Die doel van die navorsing was om te bepaal of die houding teenoor die gebruik van rekenaars 'n voorspeller is van die integrasie van IKT in die lesingsale op die Qwaqwa-kampus van die Universiteit van die Vrystaat. Houdings ten opsigte van rekenaartegnologie is bepaal deur gebruik te maak van die *Computer Anxiety Scale, Attitudes towards ICT Scale,* die *Perception of Computer Attributes Scale, Cultural Perception Scale* en die *Computer Competence Scale*. Die uitwerking van die steuringsveranderlikes (ouderdom, geslag, etnisiteit, onderwysvlak, onderwyservaring en geskiedenis van rekenaaropleiding) is beheer deur dit in te bou in die ontwerp en hul effek op die afhanklike veranderlike (IKT-integrasie) te meet. Die empiriese studie is ondersteun deur literatuur wat verband hou met IKT-integrasie in die klaskamer. Verskeie teoretiese modelle, insluitend Rogers se teorie oor die verspreiding van innovering (1995) en Ajzen en Fishbein se teorie van berekende aksie (1980) is gebruik om die sleutelfaktore wat IKT-integrasie in die klaskamer beïnvloed, beter te verstaan, asook die houdings van akademiese personeel teenoor IKT-integrasie in die klaskamer. 'n Kwantitatiewe inferensiële navorsingsontwerp is gebruik om die moontlike verwantskap tussen houdings teenoor rekenaargebruik en IKT-integrasie in die klaskamer te ondersoek. 'n Aangepaste vraelys is gedurende die 2011- tot 2013- akademiese jare onder al die akademiese personeellede op die Qwaqwa-kampus van die UV versprei. In totaal het een honderd akademiese personeellede aan die studie deelgeneem. Beskrywende en inferensiële analises (vol-model- liniêre regressie en analise van ko-variansie [ANCOVA]) is gebruik om die verhouding tussen houdings jeens rekenaargebruik en IKT-integrasie in die klaskamer te assesseer. Die resultate van die studie het nie 'n betekenisvolle verhouding tussen rekenaar-angs en houdings jeens rekenaargebruik en IKT-integrasie aangedui nie, maar het wel op 'n matige verband tussen rekenaarkenmerke, kulturele persepsie en IKT-integrasie gedui. Rekenaarvaardigheid is beskou as die faktor wat IKT-gebruik in die klaskamer die meeste beïnvloed. Op grond van die bevindinge, word aanbeveel dat effektiewe institusionele ondersteuning (ten opsigte van geleenthede vir akademiese personeel om voldoende vaardighede en kennis te bemeester) verskaf word om die integrasie van IKT in die lesingsale te vergemaklik en te bevorder. In die lig van die onlangse

bekendstelling van tegnologie op die QwaQwa-kampus van die Universiteit van die Vrystaat, moet die instelling nie slegs daarop fokus om rekenaars aan beide die akademiese personeel en studente te verskaf nie, maar moet ook ŉ kultuur van aanvaarding van hierdie onderrigleerhulpmiddel onder die akademiese personeel en studente skep. Akademiese personeel moet daarvan verseker word dat tegnologie hul onderrig interessanter, makliker, en meer prettig vir hulself en die studente kan maak, asook meer motiverend en aangenamer.

## Abbreviations and Acronyms

ANCOVA – Analysis of Covariance

ARPA - Advanced Research Projects Agency

ARPANET – Advanced Research Projects Agency Network

AVOIR - African Virtual Open Initiatives and Resources

CLE – Collaboration and Learning Environment

C-TPB-TAM – Combined Theory of Planned Behaviour/Technology Acceptance Model

DOD – Department of Defence

DoE – Department of Education

DoI – Diffusion of Innovation

EFA – Educational for All

HEIs – Higher Education Institutions

ICT – Information and Communication Technology

ITU – International Telecommunication Union

IPTO - Information Processing Techniques Office

LMS – Learning Management System

MM – Motivational Model

MPCU – Model of PC Utilization

NCES - National Center for Education Statistics

OTA - Office of Technology Assessment

PCs – Personal Computer

PEOU – Perceived Ease-of-Use

PU – Perceived Usefulness

SAS – Statistical Analysis for Social System

SCT – Social Cognitive Theory

SNO – Second National Operator

TAM – Technology Acceptance Model

TPB – Theory of Planned Behavior

TRA – Theory of Reasoned Action

UFS – University of Free State

UJ – University of Johannesburg

UK – United Kingdom

US/USA – United States of America

UTAUT – United Theory of Acceptance and Use of Technology

UWC - University of the Western Cape

WWW - World Wide Web

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# CHAPTER 1

# ORIENTATION TO THE STUDY

## 1.1 INTRODUCTION

The information and technological age is upon us. This is due to rapid growth in information and communication technology (ICT) (Adesida, 2008:8). New technologies are changing the way we live, work and learn, and transforming many aspects of social, educational and economic organization in ways we could have hardly imagined less than two decades ago.

Higher education institutions (HEIs) are also affected by the penetrating influence of ICT (Ololube, 2006: 71). Undoubtedly, ICT has impacted the quality and quantity of teaching, learning, and research (Ololube, Ubogu and Egbezor, 2007: 187). It offers many ways of improving teaching and learning in the classroom and administration and provides opportunities for students whose choices may be limited due to lifestyle and life commitments and are subsequently unable to attend classes and to discuss class work with lecturers and colleagues. ICT makes it easier to register students, keep and retrieve student records electronically (rather than manually) process and store marks, enable students to submit assignments, communicate with lecturers at any time, and also maintain contact easily with their classmates (Ibrahim, 2007: 316).

Although ICT is one of the most significant tools in education, wide disparities exist in its adoption and use within and between institutions (Bingimlas, 2009:235). Despite ICT's ability to act as a tool for change, the fact that ICT provision within and between institutions still exists will hold back educational development that is needed (Informa Media and Telecom, 2010:1). Hennessy, Harrison and Wamakote (2010: 39) identified a range of physical and educational factors that affect ICT integration and adoption in the classroom. These include, among others, unreliable access to electricity, limited technology infrastructure (especially internet access, bandwidth, hardware and software provision) and teacher attitudes towards ICT use. Among these factors, teacher-related variables such as teachers' attitudes towards ICT are found to be the most powerful predictors of technology integration (Sang, Valcke, van Braak, Tondeur and Zhu, 2011: 160). Therefore, teachers' attitudes could positively impact ICT integration in the classroom at HEIs.

This study investigated the relationship between lecturer attitudes towards computer usage and ICT integration in the classroom at the QwaQwa campus of the University of the Free State (UFS). The concept "attitude" has been defined in several ways. Coleman (2001: 63) defines an attitude as "... a more or less consistent pattern of, cognitive or conative, and behavioural responses (or of feeling, thinking, and behaving) towards a psychological object ...". Kerlinger (1986: 495) offers a similar definition wherein he states that an attitude "... is an organised predisposition to think, feel, perceive, and behave toward a referent or cognitive object". Halloran (1970:20) defines an attitude as "... the predisposition of an individual to evaluate some symbol or object or aspect of his world in a favourable or unfavourable manner". In this study, computer attitude is operationally defined as the degree of favour or disfavour with which academic staff at the QwaQwa campus of the UFS evaluate the presence and use of ICT in rural South African HEIs.

For the purpose of this study computer attitudes are defined as scores on the following scales (Heinssen, Glass and Knight, 1987: 49-59; Albirini, 2006: 390-395):

- The Computer Anxiety Rating Scale
- The Attitudes towards Technology Scale
- The (Perception of) Computer Attributes Scale
- The culture Perception (of Computers) Scale, and
- The Perception of Computer Competence Scale

The study is limited to an investigation of the general use of computers and the use of computers to access the internet, even though ICT has a broader definition and includes a variety of technologies. Previous studies on ICT activity focused primarily on general use and importance of ICT in South Africa's education sector (e.g. Assar, El Amrani and Watson, 2010; Amedzo, 2007). To date, no published study has been conducted to assess the reaction of academic staff to ICT. This study, therefore, is the first step in examining rural South African university academic staffs' attitudes toward ICT integration. The QwaQwa campus is situated in the eastern Free State region. It is close to Phuthadjhaba and is the only university campus in the region. The campus is based in a typical rural setting and serves a population of over one million people, mainly from KwaZulu-Natal and Mpumalanga, as well as the eastern Free State region. It has over 300 high schools in its catchment area.

## 1.2 THEORETICAL FRAMEWORK

This study was conducted within the theory of Diffusion of Innovations that was proposed by Rogers (1995) and the Theory of Reasoned Action proposed by Ajzen and Fishbein (1980). Rogers' theory explains the process of change with the adoption of new technologies and is the most widely used in research on diffusion of technology (Albirini, 2006:376) and suits this study. Likewise, Ajzen and Fishbein's (1980) Theory of Reasoned Action has important implications for computer use and has been successful in explaining a wide variety of behaviours and the link between computer user attitudes and computer usage (Davis, Bagozzi & Warshaw, 1989:984).

## 1.3 PROBLEM STATEMENT

Despite demonstrated interest by African policymakers in the use of ICT to meet Education for All (EFA) objectives and the needs of the rural and under-served areas, there has been no consolidated documentation of what is actually happening in this area, or comprehensive baseline data on the state of ICT use in education in Africa, against which future developments can be compared (Farrell and Isaacs, 2007:6). South Africa is not an exception, as reported by Wilson-Strydom, Thomson and Hodgkinson-Williams (2005:72) who contend that the use of ICT in education continuously pose challenges to the HEIs despite the efforts of these institutions in ICT investments.

The past years have seen an increased interest in technology in many HEIs in South Africa and, as a result, these institutions are spending much of their budgets on ICT infrastructure (Czerniewicz, Ravjee and Mlitwa, 2006:7). However, the expected benefits have not been attained and ICT integration for teaching and learning still remains low. Govender and Govender (2010: 52) has pointed out that most institutions in South Africa have computers, but not all educators are using them. For example, in the current study, the involved University – QwaQwa campus of the UFS, provides short workshops throughout the year on the applications of technology in the classroom and strategies for cooperative learning for its academic staff members. At the same time, the university offers technical and instructional consultant services through the department of e-learning to the academic staff members who are interested in integrating instructional technology in their teaching activities.

The University has also bought a site license for a learning management system (Blackboard) as well as personal computers for each of the academic staff, and it provides the academic staff members with any educational software that they need for instruction. In addition, the University started a computer project for students in which about 1000 desktop computers with 24 hours internet connections were installed in the various laboratories and the library on the campus. Internet connection was also made available to the students at their residences for easier accessibility. Since 2010, the students underwent various training sessions in the use of the learning management system (LMS), Blackboard, to enhance their learning during their studies.

Despite all this support and the availability of the technological tools, academic staff members are still reluctant to integrate ICT into their teaching activities. Based on the above discussion, it is clear that a key aspect has been excluded from both the technology plans and their subsequent implementation processes: the attitudes of the end-users and the real agents of change within the classroom arena, the academic staff. There is little point in providing large quantities of equipment if academic staff does not have the attitudes, knowledge and skills necessary to change their classroom practices.

It is widely accepted that unless academic staff develops positive attitudes toward ICT, they will not use ICT in their teaching practice. The strong relationship between computer-related attitudes and computer use in education has been documented in many studies (Myers and Halpin, 2002; Albirini, 2006; Usun, 2009). For instance, Usun (2009:331) argues that academic staff's attitudes toward ICT may be a significant factor in the implementation of ICT in the classroom. While a number of studies on academic staff's attitudes and ICT integration have been conducted in developed countries, there are no reported studies investigating this topic in rural South African HEIs or even South African HEIs as a whole. This study attempts to fill this void and explores the rural South African university academic staff's attitudes towards and integration of ICT in the classroom.

## 1.4 STATEMENT OF THE RESEARCH QUESTION

Following the above discussion, the research question is stated:

***Do attitudes towards computer usage predict the integration of information and communication technology in the higher education sector?***

*The construction attitude is defined by five questionnaires and therefore the subsidiary questions that emerged from the above research question are:*

- What is the level of computer anxiety of the academic staff at QwaQwa campus?

- What are the attitudes of the academic staff towards ICT integration?

- What is the perception of the academic staff of computer attributes?

- What is the perception of academic staff of computer culture and ICT integration at the QwaQwa campus?

- What is the perception of the academic staff of their computer competence?

## 1.5 THE AIM OF THE RESEARCH

The primary aim of this study was to determine whether attitudes towards computer usage predict ICT integration in the classroom at the QwaQwa campus of the University of the Free State.

The following objectives emanated from this aim:

- To measure the level of computer anxiety amongst the academic staff at the QwaQwa campus and determine whether computer anxiety predict ICT Integration.

- To measure the attitudes of QwaQwa campus academic staff towards computer technology usage as a predictor of ICT integration in the classroom.

- To measure the perceptions of academic staff towards computer attributes and determine whether computer attributes predicts ICT Integration.

- To measure the perceptions of academic staff regarding the relationship between computer culture and ICT integration at the QwaQwa campus.

- To measure the perceptions of academic staff regarding computer competence at the QwaQwa campus and determine whether computer competence predict ICT Integration.

- To research and discuss the theories underpinning change of attitudes.

## 1.6 HYPOTHESES

Research data were collected from academic staff at the QwaQwa campus of the UFS. The data were as analysed and interpreted to test the following hypotheses (specific null hypotheses and corresponding alternative hypotheses):

***Hoa:*** Computer anxiety does not predicts ICT integration

***H1a:*** Computer anxiety predicts ICT integration

***Hob:*** Computer attitudes do not predicts ICT integration

***H1b:*** Computer attitudes predicts ICT integration

***Hoc:*** Computer attributes do not predicts ICT integration

***H1c:*** Computer attributes predicts ICT integration

***Hod:*** Computer culture does not predicts ICT integration

***H1d:*** Computer culture predicts ICT integration

***Hoe:*** Computer competence does not predicts ICT integration

***H1e:*** Computer competence predicts ICT integration

The level of significance for hypothesis testing was 0.05 (95% confidence level).

## 1.7 RESEARCH DESIGN AND METHODOLOGY

In discussing the research design and methodology of the study, it is necessary to first identify the variables.

### 1.7.1 Identifying the Variables

Fraenkel et al. (2008: G-8) define a variables as a “characteristic that can assume any one of several values”. The different forms of variables used in this study will be discussed below:

#### 1.7.1.1 The dependent variable

The dependent variable in this study is ICT integration. ICT integration is a process of using any ICT tool to enhance student learning (Earle, 2002:5). ICT refers to a “diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information” (Blurton, 2002:1). Technologies included in ICT are: radio and television (broadcasting technology), telephony, computers, and the internet. For the purpose of this study, ICT integration was operationally defined as a score on the ICT Integration Scale.

#### 1.7.1.2 The independent variables

For the purpose of this study the independent variable, namely attitudes towards computer usage, was measured by:

1. A Computer Anxiety Rating Scale which determined the anxiety experienced by the academic staff when using computers.

2. An Attitude Toward Technology Scale, which determined:

2.1 *The affective response* (academic staff's emotional response or liking/disliking of ICT in education)

2.2 *The cognitive response* (academic staff's factual knowledge about ICT or their beliefs about the significance of the computers in the classroom practice)

2.3 The *behavioural* domains of computer attitude (what an academic staff member actually does or intends to do with ICT).

3. A Computer Attributes Scale which determines academic staff members' attitude towards computer attributes. Computer attributes include: the level of relative advantage (the benefits gained as a result of computer use in the classroom), compatibility (whether computer use is compatible with current academic staff teaching style), complexity (easy to use and learn) and observability (outcome results are visible).

4. A Cultural Perceptions Scale which determines the academic staffs' perceptions of the culture of computers.

5. A Computer Competence Scale which determines the level of the academic staff's knowledge of and skill in computer use.

1.7.1.3 The confounding variables

The confounding variables in this study are age, gender, ethnicity, educational level, teaching experience, and computer training history. Their effect on the dependent variables was controlled by measuring them on a Biographic Questionnaire and statistically accounting for their influence (McMillan and Schumacher, 2006: 118).

### 1.7.2 Research Design

The study was conducted by implementing a quantitative non-experimental multivariate survey type design due to the nature of the research hypotheses. The study was non-experimental because no attempt was made to manipulate the variables (Gray, 2009:142).

The study was located within the post-positivist paradigm to ensure objectivity and neutrality in the search for probabilistic evidence (Polit and Beck, 2008:15).

#### 1.7.2.1 Sampling

In research, sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent the larger group from which they were selected (Gray, 2009:101). The research targeted all the academic staff members at the QwaQwa campus. This constituted a form of whole-frame sampling based on the principle of convenience of sample selection.

#### 1.7.2.2 Data collection

The data were gathered by means of a questionnaire consisting of six scales, and a Biographic Questionnaire (see Appendix C). The questionnaire was administered to all academic staff at the QwaQwa campus of the UFS. A total of 100 questionnaires were distributed over a period of ten days. The questionnaires were delivered in person by the researcher to each academic staff member at their respective offices. The academic staff members were given two weeks to complete the questionnaire. Three days before the deadline, the academic staff was reminded via email to complete the questionnaires. The questionnaires were collected in person by the researcher.  The response rate was 84 per cent.

1.7.2.3 Measuring instruments

The research instruments used to gather data from the academic staff were survey questionnaires, namely;

- Computer Anxiety Rating Scale
- Attitudes towards Technology Scale
- Perceived Computer Attributes Scale
- Cultural Perceptions Scale
- Computer Competence and
- ICT Integration Scale

A discussion of the instruments used follows below:

*1.7.2.3.1 Demographic information*

The section on demographic information contained questions regarding the age, gender, ethnicity, educational level, teaching experience, and computer training background of the respondents.

*1.7.2.3.2 Computer Anxiety Rating Scale*

Computer Anxiety Rating Scale was used to assess the subjects' level of computer anxiety. Computer Anxiety Rating Scale is a nineteen-item scale designed by Heinssen et al. (1987: 49-59). The participant responded on a 6-point Likert-type scale with response options ranging from "strongly agree" to "strongly disagree".

*1.7.2.3.3 Attitudes toward Technology Scale*

Twenty attitude-related statements comprised the Attitude toward Technology Scale that was used (Albirini, 2006: 391). The statements took into account the ***affective elements*** (the emotion or feeling of the academic staff and included statements of likes or dislikes to ICT in education; the ***cognitive elements*** (academic staff's factual knowledge about ICT, or a belief that they held about the significance of computers in the classroom practice), and ***behavioural elements*** (what an academic staff member actually does or intends to do regarding ICT). Attitude toward Technology used a 6-point Likert-type scale with response options ranging from "strongly agree" to "strongly disagree".

*1.7.2.3.4 Computer Attributes Scale*

The computer Attributes Scale consisted of eighteen items on a 6-point Likert-type scale with response options ranging from "strongly agree" to "strongly disagree" (*cf.* Albirini, 2006: 392-393). The items focused on the level of relative advantage, compatibility, complexity, and observability of the computers as perceived by academic staff at the QwaQwa campus, UFS.

*1.7.2.3.5 Cultural Perceptions Scale*

The cultural perceptions scale consisted of sixteen item on a 6-point Likert-type scale with response options ranging from "strongly agree" to "strongly disagree" (*cf.* Albirini, 2006: 393-394). The statements took into account the academic staff's perceptions of the cultural value, relevance, and impact of ICT as it relates to both South African scholastic and national cultures.

*1.7.2.3.6 Computer Competence Scale*

The computer competence scale consisted of fifteen items on a 6-point Likert-type scale with response options ranging from "no competence" to "extraordinary competence" (Albirini, 2006: 394-395). The items focused on the common computer uses in education: software installation, basic hardware, productivity software (e.g. word processing), telecommunication resources, basic troubleshooting, graphic application, grade keeping, educational software evaluation, organization tools (e.g., use of folders), and virus handling.

*1.7.2.3.7 ICT Integration Scale*

The ICT integration scale consisted of ten statements on a 6-point Likert-type scale with response options ranging from "never" to "always" (Baatjies, 2009: v). The ten statements about ICT integration took into account academic staff's effort to integrate ICT into their classroom teaching and learning in general and test grading.

1.7.2.4 Analysis of Data

The data were coded by the department and then captured by the Department of Information and Technology Services at the UFS. This department analysed the data quantitatively using Statistical Analysis System (SAS). Descriptive and inferential statistics (univariate, full-model linear regression and analysis of covariance (ANCOVA)) were used to describe and summarize the data collected from the respondents.

## 1.8. DEMARCATION OF THE STUDY

This study was limited to academic staff on the QwaQwa campus of the UFS. The study was conducted within the field of higher education studies and the area of study is what Tight (2003:7) refers to as "the technologies for learning". Ethical aspects of the study will be discussed in Chapter 4.

## 1.9. SIGNIFICANCE OF THE STUDY

The study is significant because the relationship between ICT integration and academic staff attitudes towards computer use at rural South Africa HEIs has not previously been investigated. The outcome of this study will enable the institutions to make informed decisions on the use of ICT in the classrooms and the attitudes of academic staff towards ICT, thus providing a basis for in-depth discussion of the development of ICT in institutions. The study will also be of significance to the academic staff as academic staff may benefit personally by reflecting on their attitudes, feelings, perceptions, skills with regards to technology use in the classrooms.

This study adds to the wide range of literature that is available on ICT and education issues in South Africa and other developing countries. The study will also help those involved in the technology implementation process plan to identify barriers as perceived by academic staff. It is hoped that decision-makers will gain insight into the future direction of the implementation in the light of the academic staff's reactions to the current integration of computers with teaching. This study builds a strong foundation for future research to investigate other areas beyond the current rural academic staff's attitudes towards ICT use in South African HEIs.

## 1.10. CONCEPT CLARIFICATION

A number of key words, terms and concepts are used throughout the study. The definitions below are presented for ease of interpretation. Other concepts used in this study that may need clarification are explained in more detail as the specific concepts arise.

***Academic staff members:*** Full-time instructional staff appointed by and employed at the QwaQwa campus of the University of the Free State. The word may be used interchangeably with the word “educator”, “faculty member” or “lecturer.”

***Diffusion:*** **"**Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers 1995:5).

***Internet:*** **"**The Internet is a network of networks that interconnect millions of computers and allows information to be transported across several networks regardless of national boundaries" (Wilson, 1999:99).

***Information and Communication technology (ICT)*** refers to a "diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information." Technologies included in ICTs are: Radio and television (broadcasting technology), telephony, computers, and the internet. (Blurton, 2002:1).

***ICT integration*** refers to "a process of using any ICT tool to enhance student learning" (Earle, 2002:5).

***Computer Attitudes:*** An attitude is "... a more or less consistent pattern of cognitive or conative, and behavioural responses (or of feeling, thinking, and behaving) towards a psychological object ..." (Coleman, 2001: 63). Halloran (1970:20) defines an attitude as "... the predisposition of an individual to evaluate some symbol or object or aspect of his world in a favourable or unfavourable manner". In this study, computer attitude is operationally defined as the degree of favour or disfavour with which academic staff at UFS; QwaQwa campus evaluates the use of ICT in the classrooms.

***Computer attributes:*** Rogers (1995:15-16) identifies five attributes of an innovation that determine its rate of adoption: (1) relative advantage, (2) compatibility, (3) complexity, (4) observability, and (5) trialibility. The five attributes respectively refer to (1) the degree to which an innovation is perceived as better than the idea it supersedes; (2) the extent to which an innovation is perceived as being consistent with the existing values, past experience, and needs of potential adopters; (3) the degree to which an innovation is perceived as relatively difficult to understand and use - some innovations are readily understood by most members of a social system, other innovations are more complicated and will be adopted more slowly; (4) the degree to which the results of an innovation are visible to others; and (5) the degree to which an innovation is experimented with on a limited basis. In this study, "computer attributes" is operationally defined as the level of relative advantage, compatibility, complexity, and observability of the computers as perceived by academic staff at UFS; QwaQwa campus.

***Computer anxiety:*** A computer anxiety is "an individual feeling of discomfort, apprehension and fear of coping with ICT tools or uneasiness in the expectation of negative outcomes from computer-related operations" (Igbaria and Parasuraman, 1989:379; Chang, 2005:715).

***Cultural perceptions:*** "Cultural perceptions" is based on Rogers's (1995:26) very general idea of "social system norms". In this study, "cultural perceptions" is operationally delineated to mean the academic staff's perceptions of the value, relevance, and impact of ICT as it relates to the cultural norms in South African society and institutions.

***Computer competence*** refers to academic staff's beliefs about their computer knowledge and computer skills as measured by the instrument used for this study.

***Computer knowledge*** is the level of understanding of the main computer hardware components and software applications identified as essential for educational computer use.

***Computer skill*** is the ability to use the main computer hardware components and software applications identified as essential for educational computer use.

***Innovation:*** "An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (Rogers 1995:11). Technology is an innovation.

***Academic staff's personal characteristics*** are the demographic information about academic staff such as age, gender, ethnicity, educational level, teaching experience, and computer training background.

***Computer training*** refers to any type of activity, including college computer courses, public or private computer in-service training, training seminars or workshops, peer staff development, etc. that helps academic staff to learn about computers and computer usage.

## 1.11. OUTLINE OF THE STUDY

This report contains six chapters. *Chapter one* provides a general overview of and introduction to the study in order to orientate the reader to the study. It includes the statement of the research problem, aims of the research, research design and methodology, demarcation of the study, significance of the study, concept clarification and the outline of the study. *Chapters two and three* contain a review of the literature and theoretical framework of the study.

*Chapter four* describes the research design and methodology that were used for the study, including a description of how the data were collected and analysed. Aspects such as sampling, ethical considerations and reliability and validity are dealt with in detail. In *Chapter five* the findings of the study are discussed. *Chapter six* presents the conclusions of the study, limitations and recommendations for future research.

## 1.12. CONCLUSION

In this chapter, the study was introduced with regard to its content, aims and the research question(s). The research problem was elucidated. The research design and methodology were also briefly explained, the field of study was demarcated and relevant concepts used in the research were defined. Finally, an outline of the research was given. The next chapter will focus on the review of related literature to provide an insight into the context and theoretical framework of this study.

# CHAPTER 2

# THE HISTORY OF ICT DEVELOPMENT AND ITS ROLE IN TEACHING AND LEARNING

## 2.1 INTRODUCTION

The purpose of this chapter is to review literature that is directly related to the current study. The chapter explains the rationale behind the use of ICT, particularly in education. First of all, a brief account of ICT development, the initial entry of ICT into American education and its spread to other countries around the world in general is provided. This is followed by a more detailed discussion of the benefits and role of ICT in teaching and learning. The last section of this chapter sheds light on the role of ICT in the South African higher education system and its integration in the classroom. The literature on ICT integration in the classroom does not only concentrate on higher education, but it also takes into account the general acceptance of ICT integration across all levels of the education system.

## 2.2 DEVELOPMENT OF ICT IN EDUCATION

Educational technology has been part of the American public interest in science and technology for decades (Sofia, 1998:37). Historically, this interest had political and economic roots (Douglass, 1999:1). The event that ignited this interest occurred in 1957, when the Soviet Union successfully launched SPUTNIK, the first space satellite (Douglass, 1999:2). This event, which credited the Soviet Union's educational system for its success of the launching of SPUTNIK, was a concern for the United States because they were falling behind their competitors in the field of science and technology (Shelly, Judd, Kaufmann, Napier and Cashman, 2004:12). Spurred by the Russians' advancement in space age technology, the traditional American education system was found "inadequate and inefficient" to produce the scientists and engineering students that its Soviet counterpart had done and a call for reform was initiated (Wright, 1998:39; Douglass, 1999:2). Higher education, and the research university in particular, bore the brunt of the national failure regarding the space race (Douglass, 1999:3). The US government initiated a push for scientific advances and charged the Department of Defence (DOD) to create the Advanced Research Projects Agency (ARPA) (Schneider and Evans, 2004:13).

ARPA was established to promote research that would ensure that the Russians would never again beat America in any technological race. One of ARPA's offices was the Information Processing Techniques Office (IPTO), which funded research in computer science and was highly successful in its early days, making great strides in the areas of time sharing, networking (spawning the Internet), packet satellite networking, packet radio networking, artificial intelligence, digital signal processing, high performance computing, hypertext, and much more (Glowniak, 1998:135). Computers started finding their way into the classroom in the 1960s, to produce the radical and lasting changes needed to make American educational systems more responsive to the needs of the information society (Hasselbring, 1986:25). However, the role of computers in education remained incremental and marginal because of the high cost and limited accessibility to institutions (Alessi and Trollip, 2001:12).

Computers did not occupy a relatively secure place in education until the late 1970s and early 1980s (Thomas, 1987a:11). During this period, microcomputers began to be distributed to American institutions, which saw a growing emphasis on computer education in its institutions (Schifter, 2008:9). More important, computers were perceived to have the potential to revolutionize teaching and learning just as they revolutionized all aspects of human life (Maddux, Johnson and Willis, 1996: 40). These perceptions caused the American government to develop a plan to intensify their investments in educational technologies in their educational institutions in the hope that educators could integrate them into their classroom practice. As a result of this plan, for example, during the 1990s, the government invested more than $3 billion in computer technology for the institutions (Christensen and Knezek, 2001:6). In 1995, the United States had approximately 5.8 million computers in its educational institutions (Glenn, 1997:123). Additionally, the first national educational technology plan, *Getting America's Students Ready for the 21st Century: Meeting the*

*Technology Literacy Challenge* was developed under the Clinton-Gore Administration. This plan aimed at increasing technological innovation in the classroom to enhance teaching and learning (US Department of Education - Office of Educational Technology 2000: 2).

There is little sign that expenditures for school and campus computers are slowing down. The 2005 budget for the US department of education was forecasted at over 70 billion dollars, and almost 500 million dollars were dedicated to state educational technology grants in supporting technology integration into the classrooms (US Department of Education, 2005:2).

Unfortunately, the large investment plan made little reference to educators, the real agents of change. Consequently, the classroom practices remained largely unchanged. Green (1998:1) however, contended that several years after the arrival of the first microcomputers in American institutions, and more than a decade since the era of computer revolution in education, integration of ICT into classroom practice remained to be seen. While access and availability of computers for instruction have increased tremendously in American institutions, the majority of academic staff has not effectively integrated computer tools into their daily classroom practice in a way that motivates students and enriches learning (Spotts, 1999:99). Anderson and Ronnkvist (1999:2) further suggested that the government initiative in investing large amounts of money in educational technology had yielded little benefit and little change to classroom practice. In addition, this increased availability of computers alone, would not be sufficient to promote ICT and classroom integration. Marcinkiewicz (1993:234) argued that full integration of computers into the educational system was a distant goal unless there was reconciliation between academic staff's attitudes and computers. This argument is also supported by Mumtaz (2000:337), who states that institutions can go only so far as to encourage educational technology use without taking academic staff attitudes and skills into consideration. Technology does not have an educational value in itself. It becomes important when academic staff uses it in the classroom. Therefore, any concepts underpinning technology use in the classroom would have to be accepted by academic staff before it could be integrated into classroom teaching.

In a survey of 4,083 teachers, Becker, Ravitz and Wong (1999:33) noted that despite increased availability of computers at the schools, only 22% of teachers were at that point in time integrating computers into their classroom instructions. Further evidence was also provided by Cuban (2001:104) who demonstrated that academic staff used computers less frequently and in limited ways and this did not support student learning. Cuban wrote:

> *Furthermore, most professors conduct their research, produce publications, communicate in their scholarly disciplines, and prepare for teaching through electronic means. Yet when it comes to teaching, few close observers would deny that most professors are either nonusers or occasional users of computer technology in the classroom.*

Similarly, in a study conducted by the US National Center for Education Statistics (NCES) (1999:1), only 20% of the teachers reported that they were prepared to integrate educational technology into their classrooms. Moreover, teachers who reported that they were better prepared to use technology were more likely to actually use it than those who reported being less well prepared.

The overall picture seems to show that the introduction of educational technology in institutions, although long awaited and strongly supported, encounters significant problems related to the attitudes of the academic staff who is responsible for its use in the classroom. It seems that academic staff's attitudes regarding ICT use in the classroom not only pose difficulties in the use of technology per se but also cancel the learning benefits expected to spring from the instructional reform. Fabry and Higgs (1997: 393) stated that "If the integration of technology in the classroom in the next ten years is to look any different from the last ten, we must focus time, money, and resources in areas that can have the greatest impact for our students, which is our educator. The technologies can only add value to the institutions if they are adopted and used."

The advent of the Internet and the World Wide Web (WWW) in the mid-1990s brought new opportunities in educational technology. Such an opportunity was based on the great capabilities of the computer and its related technologies to provide a rich and wide array of learning opportunities that range from access to large amounts of information to communication, and to multinational research collaboration. The new capabilities added to computer technologies qualified them to play an important role in education and has since caught the attention of many academics and governments around the globe. Beangle (2000:367) asserts that, since the creation of the World Wide Web, its potential as an instructional tool and learning environment has attracted intense academic and government interest and commercial development. Additionally, "information technology literacy" has become the centrepiece of "professional literacy" and "workforce readiness" (Resnick and Wirt, 1996:84). Starting from the mid-nineties, the use of educational technology in education has rapidly expanded both in developed and developing nations. Today, there are more than two billion internet users worldwide and many thousands of hosts (ITU, 2012:7). Growth rates in developing countries are high and the numbers are driven by countries such as China, Brazil, India and Nigeria.

## 2.3 BENEFITS AND ROLES OF ICT IN TEACHING AND LEARNING

When examining the key areas of ICT applications, education is one area that influences ICT development. As Nelson Mandela once said: "Education is the most powerful weapon which you can use to change the world" (Gokhool, 2005:6). Thus investing in education can lay the groundwork for transforming the economic landscape of a country. Today ICT is seen to be important and has contributed a great deal to the preparation of students for educational policies and strategies for effective education as well as for economic growth and the improvement of social conditions. According to section 2.1.1 of the United Nations Development

Programme of 2001, ICT is referred to as a “powerful enabler of development” because of the significant impact on the economic, scientific, academic, social, political, cultural and other aspects of life. Unwin (2009: 214) contends that ICT can be an important catalyst and tool that academic staff can use to improve teaching by giving learners access to electronic media that make concepts clearer and more accessible.

ICT has the potential to innovate, accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping institutions change (Tearle, Dillon and Davis, 1999: 11; Lemke and Coughlin, 1998 cited by Yusuf, 2005:316). Additionally, ICT is a powerful tool used to meet the learning needs of individual students, to promote equal opportunities to previously underserved communities, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who, for reasons of cost or because of time constraints are unable to study (Sarkar, 2012:35). For example, with ICT, a wealth of learning materials in almost every subject and in a variety of media can be accessed by all students from anywhere at any time of the day.

Lavin and Qiang (2004:61) state that the use of ICT in companies has contributed to economic growth by increasing labour productivity. It has been noted that the use of ICT in education is likely to have the same effect it has had in technologically enabled companies (Loveless, DeVoogd and Bohlin, 2001:70). The Chinese education policy, for example, states that if the country is to develop into a first rank industrialized nation, it must have computers in its institutions. Cuban (2001:13) writes:

> *The economic prosperity of the 1990s … has now convinced most doubters that information technologies have accelerated American workers’ productivity. As a consequence, introducing electronic tools into schools has become a priority of corporate leaders and public officials.*

The link between education and economic growth places a greater emphasis on national governments to increase the levels and quality of education. Several studies reveal that students using ICT facilities mostly show higher learning gains than those who do not use them. For instance, Kulik's (1994:26) finding across 75 studies in the United States showed that students who used computer-based tutorials in class scored significantly higher marks in exams than those who did not use computers. The findings also indicated that students who used tutorial software in reading scored significantly higher marks on reading tests and they learnt more than those who did not use tutorial software in reading.

Likewise, a study cited by Ingutia-Oyieke (2008:34), developed in 1988 by the University of Florida USA, shows that the students using ICT have consistently scored higher grades on standardized tests than their counterparts in the traditional classroom. Kulik (1994) also reported that, on average, students who used ICT-based instruction scored higher marks in exam and class tests than students without computers. The students also learned more in less time and liked their classes more when ICT-based instruction was included. Furthermore, Garrison and Kanuka (2004:100) opine that students achieve better in exams when ICT is used in the classroom. According to the World Development Report (1999:53), many studies have reported increases in students' class attendance, student engagement, motivation and attentiveness with the use of computers in the classroom.

Chia (2005) and Wang (2007) also highlighted the impact of ICT on students' learning motivation. In his study on independent student learning using ICT in Chinese schools, Chia (2005:324) found that with ICT, students were more motivated to learn, they could improve their listening skills, they could set their own goals of learning, be able to learn more based on their abilities and were able to focus on their weaknesses. Similarly, Wang's (2007:301) study showed that most students using ICT were highly motivated regardless of cultural attributes.

ICT is found to be more effective, especially when dealing with large classes where classroom size and limited staffing inhibit interaction with students in South African HEIs. According to Thomas's (2006:169) study on the first-year economic class (over 1000 students) at the University of the Free State, students reported that integration of ICT into their classroom practice had lessened their workload, aided them in preparation for lectures and improved their note-taking skills, and consequently their study skills. For example, by making use of a central, shared learning management system (LMS) such as Blackboard, students can access the course contents, lectures (PowerPoint), and study guides, and pose questions to their course lecturer or even their colleagues at any time. The collaboration and the availability of course materials to the students help them in preparation for the class and provide them with the support that they need. These students (in Thomas's study) also found it easier to concentrate in class as they had an opportunity to revise their notes that had been posted on Blackboard prior to the class sessions.

Support for this finding was also reported by Kinuthia and Dagada (2008:627) with their study done at the University of Johannesburg (UJ), where lecturers found ICT to be more effective when dealing with large classes. They stated that ICT met the diverse needs of their students (in large classes), which would have been difficult to achieve in a traditional way of teaching, due to logistic constraints and the large number of students that the lecturers were dealing with (about 2500 students).

Technology is also reported to have a great impact on the learning of children with disabilities. According to Hutinger (1996:107), computers provide diverse tools for children with disabilities and encourage autonomous behaviour as well as increase the probability that these children will interact with their learning environment. There is also evidence that technology is changing the way instructors are teaching in their classes. For instance, in a study about the effectiveness of technology in schools, Sivin-Kachala and Bialo (2000:12) reported positive and consistent patterns of academic performance and achievement when students were engaged in technology-rich environments. The importance of ICT in education has prompted Todd (1997:12) to declare that a real learning revolution has started in which educators use technologies to provide learning experiences that are qualitatively different from that of their predecessors. However, despite the apparent benefits of the use of ICT for educational purposes, studies showed that in many cases the learning potential of ICT is not fully realized as many educators do not appear to make effective use of ICT in their teaching practice (Ely, 1993; Sutherland et al., 2004; Pedretti et al., 1999; Zhao and Cziko, 2001). Harris (2002:458) concludes that the benefits of ICT will be gained when confident educators are willing to explore new opportunities for changing their classroom practices by using ICT.

## 2.4 ICT AND SOUTH AFRICAN HIGHER EDUCATION

As in many other countries around the world, the South African government maintains an optimistic view regarding ICT implementation in higher education. ICT is perceived as a panacea to many educational, social and economic problems as discussed above. In his *State of the Nation Address* at the opening of the 2001 Parliamentary session, former president of South Africa, Thabo Mbeki acknowledged the influence of ICT on higher education when he emphasised that "the application of modern communication and information technology in the fields of education, health, commerce and government will be expedited" (SABC 2001).

The role of ICT in HEIs is evident in South African national and institutional policy documents such as The National Plan for Higher Education, The National Research and Development Strategy, the National Research and Technology Foresight ICT Report, and the White Paper on e-Education (DoE [Department of Education], 2003; Czerniewicz et al. 2006). The Draft White Paper on e-Education (DoE, 2003:17) for example, states that “developments in ICT create access to learning opportunities, redress inequalities, improve the quality of teaching and learning, and provide personalized learning experiences”. The government thus has put in place policy with the goal that every South African learner in general and further education and training will be ICT capable, that is, use ICT confidently and creatively to help develop the skills and knowledge needed to achieve personal goals and to be full participants in the global community by 2013.

One of the Draft White Paper on e-Education key areas of focus was ICT in education, especially by addressing the digital divide that the country is currently facing, as well as integration of ICT into teaching and learning (DoE, 2003:8). According to Chen and Wellman (2004:40), digital divide is defined as the gap between individuals (and societies) that have the resources to participate in the information era and those that do not. The South African government has made a significant investment in ICT infrastructure development in education over the past years through partnership with proponents of ICT, the academic community, African countries and the private sector (Adam, 2003:213). A number of initiatives were undertaken in order to address problems in this regard. These initiatives include the Khanya Education Technology Project, the Blue IQ project, Microsoft schools agreement and the Intel Teach to the Future programme aimed at helping educators integrate technology into their classroom teaching to enhance student learning (DoE, 2003:10).

Intel Teach to the Future programme, for example, was originally launched in the United States in 2000 and now is used in 33 countries world-wide. The South African programme was launched in 2003 and has since been adopted by a number of South African universities (Wilson-Strydom et al. 2005:75). Various other policy frameworks have been put in place to enable the integration of ICT into teaching and learning (Hodgkinson-Williams, 2005:2).

For the past years, there has been an increase in interest in technology in many HEIs in South Africa and as a result of this interest, more institutions are spending much of their budgets on ICT infrastructure (Czerniewicz et al., 2006: 7). Additionally, a number of comprehensive strategies have been developed on an ICT policy framework that incorporates many of the objectives outlined in the white paper on e-education (DoE, 2004:10). A number of universities have implemented extensive policy frameworks governing the use of ICT in education and in institutional governance and administration, which are being developed on a continuous basis. Examples include the University of Stellenbosch's E-Campus Strategy incorporating all e-learning and the University of Pretoria's Telematic Learning and Education Innovation Strategic Plan which uses different ICTs, including interactive multimedia, computer-based assessment, interactive television, video-conferencing and Learning Management Systems (LMSs). More recently, the Tshwane University of Technology, and the Universities of the Free State, Limpopo, Cape Town and Western Cape have developed similarly comprehensive policy statements (as shown in Table 2.1 below). These strategies are aimed at improving the quality of the core functions of the university (teaching and research).

Table 2.1: University centres responsible for supporting ICTs in teaching and learning

| | |
|---|---|
| **Traditional universities** | |
| University of Cape Town | Centre for Educational Technology, Centre for Higher Education Development |
| University of Fort Hare | E-learning Section, Teaching and Learning Centre |
| University of the Free State | Centre for Higher Education Studies and Development |
| University of KwaZulu-Natal | Centre for Information Technology in Higher Education |
| University of Limpopo | Academic Computing Support Section |
| North-West University | Academic Support Services |
| University of Pretoria | Department of Telematic Learning and Education Innovation |
| Rhodes University | Academic Development Centre |
| University of Stellenbosch | Centre for Teaching and Learning |
| University of the Western Cape | Teaching and Learning Technologies Unit<br>E-Learning Division |
| University of the Witwatersrand | Centre for Learning and Teaching Development |
| **Comprehensive universities** | |
| University of Johannesburg | Centre for Teaching, Learning and Assessment |
| Nelson Mandela Metropolitan University | Centre for Teaching, Learning and Media |
| University of South Africa | Institute for Curriculum and Learning Development |
| University of Venda | Department of Information Technology Services |
| Walter Sisulu University for Technology and Science | Situation unclear in current merger context, but an academic development unit at Border Technikon (one of the merging institutions) seems to facilitate web-supplemented courses |
| University of Zululand | ICT Department (includes an 'electronic classroom' for training lecturers in online applications) |
| **Universities of Technology** | |
| Cape Peninsula University of Technology | Fundani Centre (teaching, learning and academic support)<br>Centre for e-learning |
| Central University of Technology | Centre for e-learning and Educational Technology |
| Durban University of Technology | Centre for Higher Educational Development |
| Tshwane University of Technology | Department of Telematic Education |
| Vaal University of Technology | Department of Teaching and Learning, Centre for Institutional Development |

*Source: South Africa ICTs and Higher education.*

The African Virtual Open Initiatives and Resources (AVOIR) and Sakai South Africa are other examples of projects initiated by South African higher education institutions. The AVOIR project has been initiated by the University of the Western Cape (UWC) and Sakai South Africa has been initiated by the University of Cape Town, University of South Africa and North-West University for collaboration purposes with other African higher education institutions and the three universities respectively (Isaacs, 2008:20). Sakai is a global consortium of more than a 100 higher education institutions jointly developing an open source Collaboration and Learning Environment (CLE) which is used to support teaching and learning, *ad hoc* group collaboration and support for research collaboration.

All these developments indicate that both the South African government and HEIs are committed to ICT integration in their classroom practices in an effort to create an environment for more engagement in a collaborative learning environment. These developments resulted in significant progress of ICT availability in South African institutions, but ICT is still not being effectively integrated into the classroom practice. According to Chigona and Chigona (2010:26), while more and more institutions now have access to the necessary infrastructure, educators are not integrating these technologies into their teaching. In a study at three universities in South Africa, Kinuthia and Dagada (2008:628) found that across various institutions, one of the major obstacles to the use of ICT tools was not a lack of funding or technology infrastructure, but academic staff's resistance to the use of ICT that was available to them, in their classrooms.

Anecdotal evidence from a South African rural university indicates that the majority of the academic staff members are not integrating ICT into their classroom practice even though they have computers. They use the age-old tried and tested methods of lecturing (i.e. chalk-and-talk) with no powerpoint presentations. They require students to submit written assignments, even though these assignments can be sent to them in electronic format *via* the Blackboard tools that are available. Van der Merwe and Mouton (2005:25) claimed that ICT has been met with much resistance from the lecturers concerned; consequently affecting its use in the classroom. Cuban

(2001:109) argued that computers had been oversold as a vehicle for reforming educational practices and were generally under-used as an instructional tool by educators at all levels of education.

The recent development projects initiated by the South Africa government in partnership with other African countries in the construction of several broadband fibre-optic undersea cables will provide an affordable bandwidth that would encourage volume discounts and large bandwidth growth which will have a great impact on ICT accessibility (Department of Communications, 2008: 3). These projects are set to make South African HEIs grow significantly in ICT access and usage, but ICT integration into teaching and learning remains a challenge.

## 2.5 ICT INTEGRATION IN THE HIGHER EDUCATION CLASSROOM

As discussed above, the integration of ICT in classroom teaching and learning has been one of the most important topics in the field of education. Although many attempts have been made to integrate ICT into teaching practice, little success has been achieved and it is reported that this technology is not always used as expected. Surveys indicate that computers are not fulfilling their potential to effect significant changes in education, are under-utilized, and are not being implemented in effective or creative ways (Ginsberg and McCormick, 1998; Bennet, 1997; Miller and Olson, 1995). While academic staff acknowledges the potential use of ICT in educational purposes, more often the full potential of ICT in classroom practices is not being exploited. The reality is that computers are most often employed to supplement traditional classroom pedagogy and have not been fully integrated into classroom learning activities (Kirkup and Kirkwood, 2005; Ginsberg and McCormick, 1998). Studies report several factors (barriers) that prevent ICT integration in the classroom (Ertmer 1999; Pelgrum, 2001; Lawson and Comber, 1999). These factors could vary from one place to another, depending on the environment where the technology is introduced, as well as the purpose and timing of the introduction.

In a study conducted in United Kingdom (UK), Lawson and Combler (1999:43) examined what academic staff perceived as major impediments to ICT integrating into the classroom instructions. Lawson and Combler (1999:43) found that the main obstacles were lack of academic staff's attitudes towards ICT and appropriate support and training. Williams et al. (2000:313) state that the basic factors which prevent ICT use in the teaching-learning process are lack of knowledge, skill and support. Based on a study conducted in 26 countries, Pelgrum (2001:174) found that the basic barriers faced during ICT integration into the classroom were, among others, teachers' lack of skills and knowledge.

Ertmer (1999: 50-52) divides the number of factors which prevents ICT integration into classroom practice into two categories: the external (first-order) barrier, and internal (second-order) barrier groups. External barriers include those that are often perceived as key obstacles, for example, inadequate access to the technology, inadequate training and insufficient technical support. Internal barriers are ones that are academic staff-related such as attitudes, beliefs about teaching, knowledge, practices and resistance to computers. While many first-order barriers may be eliminated by securing additional resources for provision (once money is allocated), confronting second-order barriers such as academic staff's attitudes, remain a challenge and are often thought to cause more difficulties than first-order barriers (Dede, 1998; Fisher, David and Keith, 1996). Ertmer (1999: 51) maintains that even when first-order (external) barriers are resolved, academic staff would not automatically use technology to achieve the kind of meaningful outcomes advocated, which will result in the under-use of this technology. In fact, bringing computers into the classroom does not necessarily influence the integration of ICT.

A similar sentiment was also suggested by Wood et al. (2005:185) in which he stated that some of the first-order barriers might no longer be perceived as the insurmountable barriers that they once were. For example, the majority of academic staff members now have access to and use computers on a regular basis, making technical difficulties and lack of access less problematic. Therefore, academic staff–related variables such as attitudes need to be considered for effective ICT integration into the classroom. This is important, because it is academic staff that has primary contact with students and it is academic staff that experiences the barriers and supports to integration of technology first-hand.

In light of the evidence discussed above and given the importance of academic staffs members' attitudes towards ICT integration in the teaching practice, this study will not examine the whole range of factors influencing ICT integration, but focus on the attitudes of academic staff and the factors influencing their attitudes towards ICT use in the classroom. These factors include computer anxiety, computer competence, computer attributes, cultural perceptions and academic staff characteristics which will be discussed in the following chapter.

## 2.6 CONCLUSION

Successful integration of ICT in education can lead to a number of benefits. One of the most vital contributions of ICT in the field of education is its ease of accessibility to learning resources, 24 hours a day, 7 days a week, across the geographical boundaries. In addition, ICT provides different tools to enhance learning, providing students and educators with more opportunities for feedback and reflection. ICT use in the classroom has undoubted potential to be influential in changing teaching methodologies. However, the benefits of ICT use in the classroom depend on the success with which it has been integrated.

A substantial body of research asserts that the act of integrating ICT into teaching and learning is a complex process that comes with a number of challenges which Ertmer (1999) referred to as barriers. These barriers, if not addressed, can have a profound influence on the integration of ICT in the classroom. The availability of ICT equipment does not in itself guarantee its effective use in the classroom, but the attitude of academic staff, whether positive or negative towards ICT, is an influential factor in its integration process.

For academic staff members to enthusiastically engage in ICT integration they must not only have adequate and quality resources and unhindered access, but they also need to have a positive attitude towards ICT use in the classroom. They (academic staff) need to understand and value the benefits of ICT integration. There is no point in spending huge amounts of money on buying computers if staff members do not understand 'why' they should use them.

Having established the role of academic staff as an essential factor in ICT integration, it is important to understand this factor and how it impacts on their use of ICT in the classroom. The next chapter will examine attitude as a predictor of ICT integration in classroom instruction, as well as its relationship with other factors (computer anxiety, computer competence, computer attributes, cultural perceptions and personal characteristics).

# CHAPTER 3

# ICT INTEGRATION AND COMPUTER ATTITUDE

## 3.1 INTRODUCTION

We live in a world of constantly emerging new technologies that challenge the field of education, while at the same time presenting new learning opportunities. The importance of ICT has been highlighted in the previous chapter. In recent years, ICT has caught the attention of many governments around the world and as a result, huge investments have been made in an attempt to equip HEIs with the much needed technology for classroom integration (Amiel and Reeves, 2008:30). Although there is dramatic growth in the availability of and access to technology in higher education, there is a great deal of evidence showing that ICT integration into the classroom has had little success (Abrahams, 2010:35, Buabeng-Andoh, 2012:136, Ntemana and Olatokun, 2012:182). This poses challenges for HEIs, technology advocates, and government agencies as a whole (Sutherland et al., 2004; Albirini, 2006; Hayes, 2007; Grabe and Grabe, 2008; Tezci, 2009; Abrahams, 2010).

Researchers have revealed that the successful integration and implementation of educational technologies depend largely on the attitudes of educators, who eventually determine how ICT is used in the classroom (Albirini, 2006; Al-Zaidiyeen, Mei and Fook, 2010; Bullock, 2004; Uslu and Bümen, 2012; Van Reijswoud, 2009). Computer attitudes are influenced by a wide range of factors which include computer anxiety (Yildirim 2000; Sam, Othman and Nordin, 2005), computer competence (Bingimlas, 2009), perception of computer attributes, cultural perception of computers and personal characteristics such as gender (Sadik 2006), computer training (Tsitouridou and Vryzas 2003), teaching experience (Potosky and Bobko 2001; Kumar and Kumar 2003), and age and educational level (Albirini, 2006; Tezci, 2011). Thus, computer attitudes are a key issue in technology adoption and diffusion (Rogers, 1995:6). Academic staff attitudes towards computers are therefore central to any successful ICT integration into education (Yuen and Ma, 2001:5).

When considering specific barriers or challenges within an institution and the possible institutional responses to ICT integration in the classroom, it is important to look first at the theories describing changes driven by the diffusion of innovations, adoption, acceptance, and usage. Various theoretical models have been proposed for better understanding factors that will influence the adoption of technology into the classroom. Among them, Davis and associates' technology acceptance model (TAM) (Davis, Bagozzi, and Warshaw, 1989), Rogers' (1995) theory on diffusion of innovation (DoI), Ajzen and Fishbein's (1980) theory of reasoned action (TRA) and unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis and Davis, 2003). This chapter will provide a review of these theories in an attempt to explore and understand the key factors affecting ICT integration into the classroom. Rogers's (1995) theory on diffusion of innovation and Ajzen and Fishbein's (1980) theory of reasoned action (TRA) was chosen specifically for this study due to their wider acceptance in the ICT literature (Medlin, 2001, Bennett and Bennett, 2003). The last section will shed some light on variables such as computer attitudes, computer anxiety, computer attributes, cultural perceptions and computer competence. Academic staff's personal characteristics such as gender, age, ethnicity, educational level, years of teaching experience and computer training history and the relationship between these factors and ICT integration will also be discussed.

## 3.2 ROGERS' THEORY ON DIFFUSION OF INNOVATION

Rogers's theory on diffusion of innovation (1995:2), provides a popular framework that helps to explain how new ideas and technologies are spread and adopted in a community. The framework has been used for programme planning. It has been empirically tested, and it has undergone critique from various perspectives since its inception in the 1950s (Rogers, 1995: 39; Yates, 2001:1). Throughout the years, it has remained instrumental to professionals, scholars, and students alike and continues to be useful in countless other fields, including education (Rogers, 1995). In fact, Google Scholar has, as of 13 May 2011, attributed 33,545 citations to Rogers's 1995 core text (Google, 2011, Rogers, 1995).

Rogers's theory on diffusion of innovation is particularly important because it has influenced numerous other theories of adoption and diffusion (Boyne, Gould-Williams, Law and Walker, 2005; Deffuant, Huet and Amblard, 2005; Pennington, 2004; Venkatesh and Morris, 2000). This wide applicability of diffusion theory explains why so much diffusion research continues to be conducted (Sooknanan, Melkote and Skinner, 2002:558). Surry and Farquhar (1997:24) indicate three reasons to explain why Rogers' theory on diffusion of innovations is beneficial to the field of educational technology. Surry and Farquhar states that most educational technologists do not understand the reasons why an innovation is or is not adopted and Rogers' theory on diffusion of innovations can help to explain this. Secondly, the field of educational technology is associated with the concept of innovations. The more the educational technologists understand Rogers' theory on diffusion of innovations, the better they are prepared to work effectively with potential adopters. Thirdly, studies of Rogers' theory on diffusion of innovations could result in developing a systematic model of adoption and diffusion for the field of educational technology. Since Rogers uses the terms 'innovation' and 'technology' interchangeably, the diffusion of innovation framework seems particularly suited for the study of the diffusion of ICT.

According to Rogers (1995:5), diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system". This definition implies that there are four main elements in the diffusion process: ***(1) innovation***, *(**2) communication channels, (3) time,** and* ***(4) the social system.*** These four elements explain the process of change as determined by individuals, decision-makers, or whole organizations. In the field of education, academic staff members are undeniably key agents of change on the classroom floor (Pelgrum, 2001:165).

Rogers (1995: 11) defined ***innovation*** as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption". This definition reflects the notion that the individual or social system's perception in question determines whether an idea is thought to be new or not. To be called an innovation, an idea does not have to necessarily be newly invented (Rogers, 1995:12). It is also important to note that "newness" in an innovation may not be a factor in the diffusion and adoption of innovations as an individual may have already heard about the innovation, but was not persuaded to adopt it (Rogers, 1995:13). ***A communication channel*** is "the means by which messages get from one individual to another" (Rogers, 1995:18-20). The channel can be a mass medium which is more effective in creating awareness-knowledge of innovations or an interpersonal channel involving face-to-face exchange between two or more individuals. While mass media remain effective in communicating information to large populations; the interpersonal channel is particularly effective in influencing individuals to decide whether to adopt an innovation. It is therefore, noteworthy that most people are influenced by word of mouth from others who have adopted the innovation when making innovation decisions rather than by statistics (Rogers, 1995:20). In recent years, web-based interactions such as emails, chat rooms, discussion boards and blogs have influenced adoption of innovations (Watson, 2007:10).

***Time***, which is the third main element in the diffusion of innovations process, involves three aspects of diffusion: *(a) the innovation-decision process* by which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject the innovation, then to its implementation, and finally to confirmation of this decision. Rogers (1995: 21) categorizes this innovation-decision process into five steps, namely knowledge (awareness), persuasion (attitude), decision (evaluation), implementation (trial), and confirmation (adoption), as shown in Figure 3.1. These stages follow each other in a time ordered sequence, yet the first two stages (knowledge and persuasion) are especially important as they immediately precede the decision stage. The knowledge stage occurs when potential adopters are exposed to information about existence of an innovation and gain some basic understanding of what it is and how it works.

Rogers (1995:22) notes that individuals' level of "how-to" knowledge on the target technology is a crucial determinant for the technology adoption. When the amount of "how-to" knowledge is less than that required for a successful trial period, the adoption of an innovation is often rejected. In the case of educational technology, this is where, without adequate training and technical support, most faculties get frustrated or overwhelmed and decide not to adopt the technology in their classrooms. Similarly, Seemann (2003:28) expresses the importance of users' knowledge on technology integration by emphasizing both "know-how" and "know-why" knowledge.

The knowledge stage is followed by the persuasion stage, which is related to users' attitude. Rather than just the general awareness developed in the first stage, in the persuasion stage, the individual or the social unit gets personally involved in the process by actively seeking information and forming attitudes towards the innovation (Rogers, 1995:24). This is primarily an affective (feeling) stage in contrast to the knowledge stage, which is predominantly cognitive (knowing) in nature. These two stages together lead the individual to adopt or reject the target technology (what Rogers called "decision stage"). Stages four and five (implementation and confirmation) occur in the case of adoption. Adoption is a decision to make full use of an innovation as the best course of action available while rejection is a decision not to adopt an innovation (Rogers, 1995:171).

Time also involves *(b)* the *innovativeness* of an individual in terms of how early or late he/she adopts the innovation. The rate of adoption of a new idea among a group of individuals forms an S-shaped curve when plotted on a cumulative frequency basis over time in which the adoption of a technology begins with slow change, then gradual change, followed by rapid change and ends in slow change as the new technologies emerge (Rogers, 1995: 22-23). The theory also states that following the period of rapid change, the innovation's rate of adoption will gradually stabilize and eventually decline. Rogers categorizes these groups into: innovators, early adopters, early majority, late majority and laggards. To Rogers (1995:270), individual innovativeness is highly determined by socioeconomic status. Thus, "it is assumed that individuals adopt innovations in direct proportion to their economic status; with each added unit of income, educational level, and other socioeconomic status variables, an individual is expected to become more innovative by an equivalent amount". Several researchers have derived relevant teachers' personal characteristics such as educational level from this theory (e.g. Albirini, 2006). Time involves a third aspect of innovation, namely *(c) an innovation's rate of adoption in a system,* usually measured as the number of members of the system who adopt the innovation in a given time period.

According to Rogers, the rate of adoption by the individuals in a social system is determined by the characteristics (attributes) of the innovation (Rogers, 1995:15-16). The characteristics (attributes), which determine an innovation's rate of adoption, are relative advantage, compatibility, complexity, trialability, and observability, as shown in Figure 3.1. Thus, a new technology will be increasingly diffused if potential adopters perceive that the innovation: (1) has an advantage over previous innovations; (2) is compatible with existing practices and values, (3) is not complex to understand and use, (4) can be experimented with on a limited basis before adoption, and (5) shows observable results. Rogers (1995:12) stated that "individuals' perceptions of these characteristics (attributes) predict the rate of adoption of innovations". Rogers further noted that although there is a lot of diffusion research on the characteristics of the adopter categories, there is a lack of research on the effects of the perceived characteristics (attributes) of innovations on the rate of adoption. This study addresses the four of the five perceived characteristics (attributes) of innovation, namely; relative advantage, compatibility, complexity, and observability to test their influence on academic staff's attitudes towards ICT use in the classroom (Questionnaire, section 4, Appendix C). Each of these five perceived characteristics (attributes) of innovation will be discussed in section 3.9.2 of this chapter.

The last element, ***social system***, is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal (Rogers, 1995:23). The members or units of a social system may be individuals, informal groups, institutions, and/or sub systems. The structure of the social system affects diffusion in many ways. Social norms, the role of opinion leaders (the degree to which an individual is able to informally influence other individuals' attitudes or overt behaviour in a desired way with relative frequency), types of innovation decisions and the consequences of innovation all influence the adoption of an innovation.

Research using Rogers' theory of diffusion on innovations has often been guided by the assumption that the theory incorporates several sub-theories, each focusing on different elements of the diffusion process. Because of the comprehensiveness of Rogers' theory, researchers often test and investigate some aspects of this unified theory of diffusion. In the field of education, researchers have often examined three major sub-theories related to the sphere of educational change. These sub-theories include; innovation characteristics (attributes), individual innovativeness, and innovation-decision process which was discussed above.

Bringing together the main premises discussed above, this study employs the Rogers theory on diffusion of innovation to determine the attitudes of academic staff at a rural South African university. Due to the ubiquity of computers in the South African society, it is expected that academic staff have already developed some attitudes toward computers (which represent the second phase of the innovation decision process). The study will determine attitudes of academic staff towards ICT integration in the classroom and their correlation to the innovation attributes (relative advantage, compatibility, complexity, and observability), academic staff's cultural perceptions, personal characteristics, computer competence, as well as computer anxiety (see Questionnaire, Appendix C).

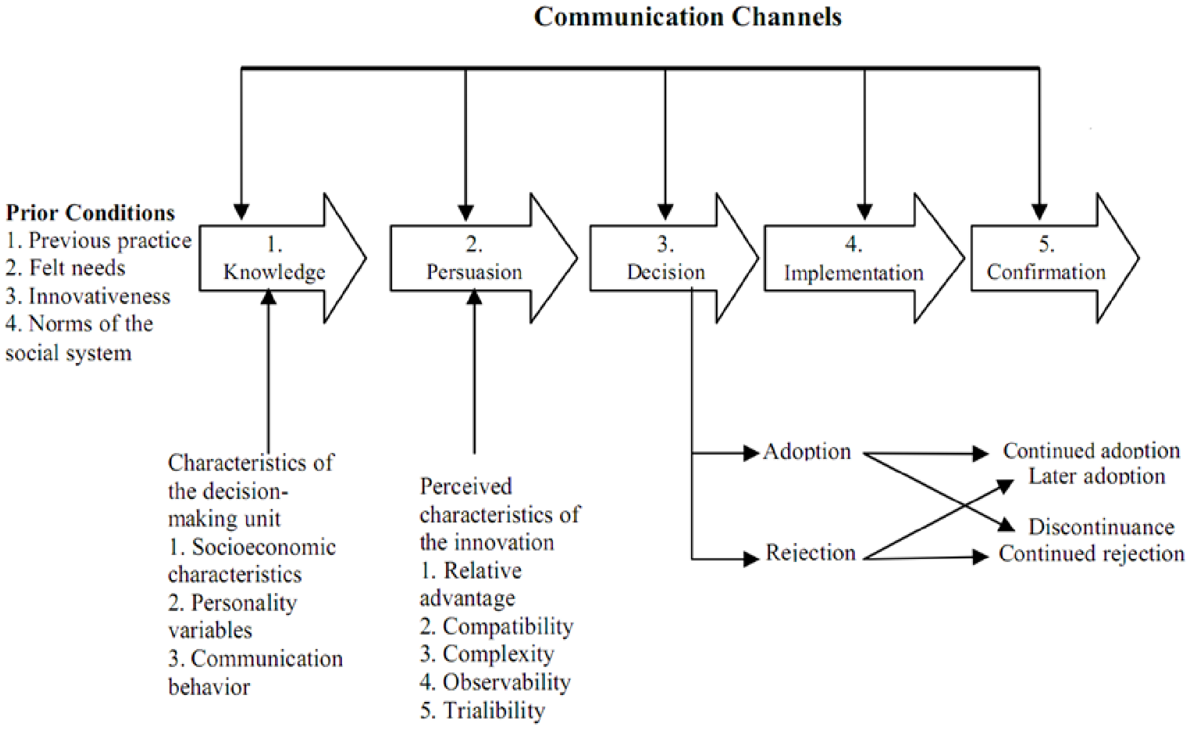


Figure 3.1: Stages of Innovation-Decision Process, based on Rogers (1995:163)

## 3.3 ANALYSIS AND CRITIQUE OF ROGERS' THEORY ON DIFFUSION OF INNOVATION

Rogers's theory on diffusion of innovation (1995) presented above is widely accepted and used often in innovation diffusion research. The theory allows diffusion scholars to utilize quantitative and qualitative research methods to explore the relationships between the four main elements in the diffusion process. It is multidisciplinary in nature and also allows researchers the ability to conduct longitudinal research to assess behavioural change. In doing so, scholars have the means to better understand the entire process by which individuals adopt an innovation. Lastly, the theory can be tested with fairly uncomplicated statistical analyses.

One of the most pervasive critiques of Rogers's theory on diffusion of innovation is what scholars' term as "pro-innovation bias". Pro-innovation bias refers to the idea that adopting the innovation will be beneficial to all potential adopters. Diffusion of innovation research rarely incorporates an analysis of the potential long-term consequences of innovation adoption, mostly because it would require full adoption or a critical mass of adopters to determine such effects. The problem of this is the assumption that adopting the innovation is the right choice. Furthermore, the pro-innovation biases are rarely reported within the diffusion of innovation research. In this study, adopting the innovation, namely ICT integration in the classroom, is assumed to be the desired outcome for faculty, because evidence has begun to amass that shows the potential benefits of ICT integration in the classroom instruction for teaching and learning purposes.

The longitudinal nature of adoption is both an asset and a hindrance to Rogers's theory on diffusion of innovation. Although the time factor allows researchers to use time-dependent statistical models, the actual recall required by adopters can potentially cause bias to the research results. Recall data requires the individual to think back in time and reconstruct his or her past history of innovation experiences. The quality of recall is variable depending on the innovation's salience, the length of time over which the recall is requested, and the individual's personal characteristics. Research shows that recall data are not completely accurate (e.g. Nicola and Giné, 2012:52).

## 3.4 RESEARCH UTILIZING ROGERS' THEORY ON DIFFUSION OF INNOVATION

As stated earlier, many studies have used Rogers's theory on diffusion of innovation to explain the phenomena of technology diffusion in higher education (Medlin, 2001; Bennett and Bennett, 2003; Li, 2004; Allehaibi, 2001; Jacobsen, 1998; Less, 2003; Gonçalves and Pedro, 2012; Surendra, 2001).

Using quantitative research methods and Rogers's theory on diffusion of innovation, Medlin (2001:25) examined a set of different factors that might influence a faculty member's decision to adopt electronic technologies in classroom instruction. These factors are: social, organizational, and personal motivational. The result showed that the personal motivation factor was the most important factor influencing faculty members' decisions to integrate technology into their classroom instruction.

Bennett and Bennett (2003:59) used Rogers' (1995) theory on diffusion of innovation to investigate the impact of perceived characteristics of instructional technology on faculty members' willingness to integrate ICT into their teaching practices. They reported the most important barriers to adopting technology use are the faculty members' reluctance in and disbelief in the use of technology, rather than the commonly recognized lack of technological infrastructure or financial funds.

Li (2004:27) used Rogers' (1995) theory on diffusion of innovation to examine factors affecting the diffusion of Web-based distance education at the China Agricultural University. The results showed that the Chinese university instructors tended to agree with the existence of the five attributes of relative advantage, compatibility, complexity, trialability, and observability. Similarly, Albirini (2006:380) found that Rogers's five perceived attributes of an innovation was an important factor influencing Syrian teacher's decisions to integrate technology into their classroom instructional.

Allehaibi (2001:10) used Rogers' (1995) theory on diffusion of innovation to find out which among five perceived attributes of innovation contributed to adoption of internet technology in a Saudi Arabian university.  The study also examined faculty members concerns in relation to technology adoption. Allehaibi found that all five of Rogers' innovation attributes were significant predictors of Internet adoption. His study also included an investigation of the adopter categories where he found 69% of faculty using technology were late adopters (using internet technology less than two years) compared with 31% who were early adopters (using technology for more than two years).

Jacobsen (1998) mixed-method approach research study also used Rogers' (1995) theory on diffusion of innovation to determine the adoption patterns and characteristics of faculty who integrate computer technology for teaching and learning in higher education. His finding suggested that a positive attitude toward an innovation does lead to its adoption.

Less' (2003:84) quantitative research study used Rogers' (1995) theory on diffusion of innovations to investigate faculty adoption of computer technology for classroom instruction in the North Carolina Community College System. She classified the faculty members based on Rogers' five categories of innovation adoption and compared them on the demographic variables of age, gender, race/ethnicity, teaching experience, and highest level of education. While a significant relationship emerged between Rogers' adopter categories and their years of teaching experience and highest education level, the results did not show an important difference between faculty adopter categories and age, gender, and race/ethnicity. Less further classified the faculty as users in any of Rogers' five categories and non-users of computer technology in classroom instruction. No significant difference existed between users and non-users in demographic characteristics of age, gender, race/ethnicity, teaching experience and highest educational level.

Gonçalves and Pedro (2012:239) used Rogers's theory on diffusion of innovation (adopter categories) to analyse the different stages of technology (Learning Management System) adoption among the faculty member at the University of Lisbon over a period of three academic years. The result indicates a significant increase in LMS adoption in teaching practice over the three academic years. For example, in 2008/09, the percentage of faculties that registered in Moodle platforms was near 4%, in 2009/10, that number grew to 15% and in 2010/11 that number increased to near 39%. Gonçalves and Pedro categorized these stages as innovators, early adopters and early majority respectively.

Using Rogers' theory on diffusion of innovation and other sources, Surendra (2001:57) employed quantitative research methods to investigate the adoption of Web technology by professors and administrators of a college in Canada. Computer access in general and computer training in particular were found to be the best predictors in the diffusion process of Web technology-based educational innovation. Moreover, he found that one of the diffusion factors namely, Rogers' attributes of innovations, is a useful predictor of the adoption of technology. Also, a relationship was found between computer knowledge and the computer adoption.

## 3.5 THEORY OF REASONED ACTION (TRA)

Theory of Reasoned Action, developed by Ajzen and Fishbein (1980), is one of the most influential theories used in explaining the relationship between human behaviour and intention to adopt a new innovation and it is widely used today (Venkatesh, Morris, Davis and Davis, 2003:425). According to this theory (see Figure 3.2), a person's intention to perform (or not perform) a certain behaviour is a function of two basic determinants, one personal in nature (attitude towards the behaviour) and the other reflecting social influence (subjective norms) (Ajzen and Fishbein 1980:6). *Attitude towards behaviour* can be described as a person's subjective forecast of how positive or negative he/she will feel when performing the behaviour, whereas *subjective norm* can be viewed as a person's perception of the social pressure on him/her to perform the behaviour. Together, both factors are predictors of intentions and the relative weights for each factor may differ from one individual to the other. Research on attitudes led Ajzen and Fishbein (1980:6) to believe that attitudes toward behavior are a function of personal beliefs. According to the TRA theory, the beliefs that underlie attitudes toward the behavior are called behavioural beliefs and beliefs that underlie the subjective norms are called normative beliefs. Ajzen and Fishbein (1980:7) posit that behavioural and normative beliefs are based on information that individuals hold about themselves and the world in which they live. Based on this beliefs-attitudes-intentions paradigm, it has been hypothesized that computer attitudes affect users' behavioural intentions, affecting their computer usage (Rainer and Miller, 1996:101).

In summary, personal and normative beliefs influence attitudes and subjective norms respectively. These two factors, weighted accordingly, influence intentions, and intentions influence behavior. The authors argue that an interest in understanding behaviours is important so that we can eventually influence change. According to the TRA, behavioural change is ultimately the result of changes in beliefs. This implies that we have to expose individuals to new information, which produces a change in their beliefs, either personal or normative. The authors propose that by producing a change in beliefs, we can produce a change in attitudes, which can change intentions, which ultimately brings about the desired behavioural change. Academic staff attitudes in this study, were examined from this theory and Rogers theory on diffusion of innovation (Questionnaire, section 3, Appendix C).

Like all the other theories, TRA theory has also some limitation including a significant risk of confusion between attitudes and norms since attitudes can often be reframed as norms and vice versa. A 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 organisational limits, and unconscious habits will limit the freedom to act.

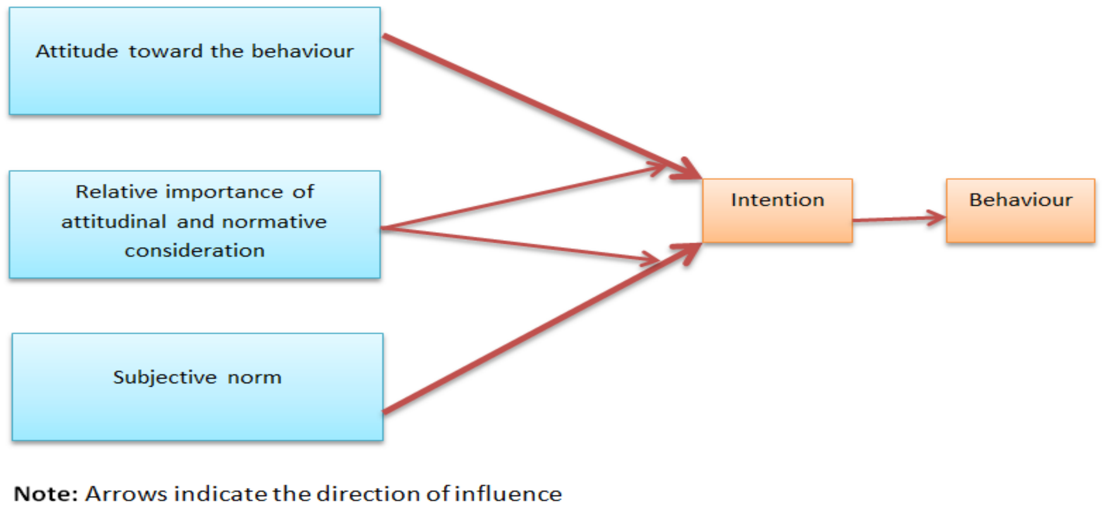


Figure 3.2: Factors determining a person's behaviour, based on Ajzen and Fishbein's Theory of reasoned action (1980:8).

## 3.6 TECHNOLOGY ACCEPTANCE MODEL (TAM)

The Technology Acceptance Model (TAM) proposed by Davis (1989) was derived from the Theory of Reasoned Action (TRA) to explain the behavioural intention and actual behavior of a person's computer usage. While TRA is a general theory to explain general human behavior, TAM is specific to information system usage. The model suggests that when users are presented with innovation, a number of factors influence their decision about how and when they will use it (see Figure 3.3). These factors include; *Perceived usefulness (PU)* and *Perceived ease-of-use (PEOU)*. These two concepts are fundamental in understanding the core workings of TAM. According to Davis (1989:320), *perceived usefulness* is "the degree to which a person believes that using a particular system would enhance his or her job performance" while *perceived ease of use* is "the degree to which a person believes that using a particular system would be free of effort." Hence, even if a system is believed to be useful by an individual, if the system is too hard to use, the potentially enhanced performance benefits to be derived from the system are outweighed by the effort required of having to use it. Davis (1989) has also found that there is a relationship between users' beliefs about a technology's usefulness and the attitude and the intention to use the technology. However, perceived usefulness exhibited a stronger and more consistent relationship with usage than did other variables reported in the literature. The TAM replaces many of TRA's attitude measures with the two technology acceptance measures "ease of use", and "usefulness".

Although TAM was influential in predicting and explaining user acceptance of new technology in general, it lacks the specificity of users' opinions on specific system or technology. TAM's focus on PU and PEU did not cover whether there is the need for applicability of a technology or whether it is "objectively" useful. Davis (1989:334), one of the pioneers of TAM, has admitted that his model requires "further research (to) shed more light on the generality of (its) findings". Therefore, it is necessary to search for other theories to augment the explanation of users' acceptance of technology systems within a specific educational context.

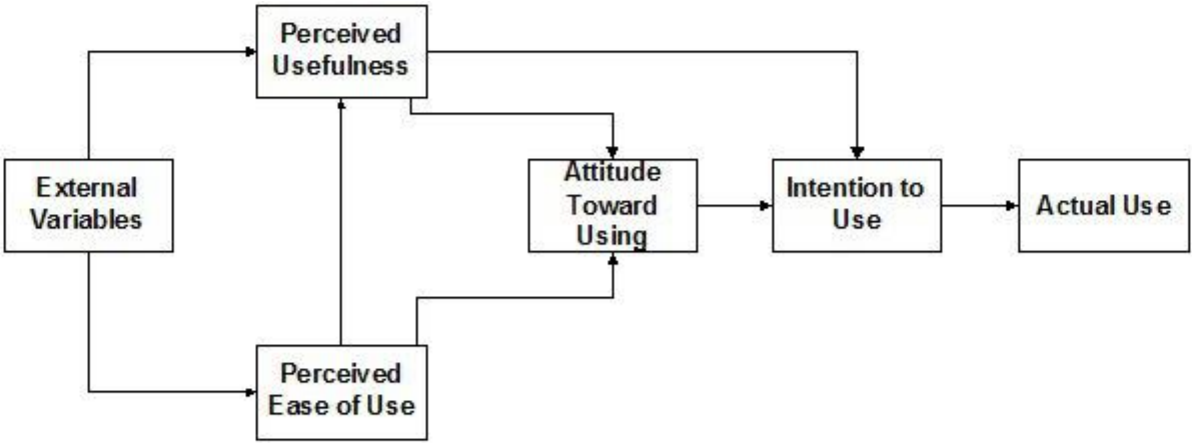


Figure 3.3: Technology Acceptance Model (Davis et al. 1989:985)

## 3.7 UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY (UTAUT)

The UTAUT is a unified model that was developed by Venkatesh, Morris, Davis and Davis (2003) in order to provide a unified theoretical basis from which to facilitate research on ICT adoption and diffusion. The theory postulates that four core constructs - *performance expectancy, effort expectancy, social influence and facilitating conditions* are direct determinants of technology acceptance (behavioural intention) and use (behaviour). The theory also suggests that the effect of these four constructs is moderated by *gender*, *age*, *experience*, and *voluntariness of use* (Venkatesh et al., 2003). See Table 3.1 for a definition and root constructs of the UTAUT model.

The UTAUT model was developed through the review, mapping and integration of eight dominant theories / models. The eight theories / models are the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1980), Technology Acceptance Model (TAM) (Davis, 1989), the Motivational Model (MM) (Davis, Bagozzi and Warshaw, 1992), the Theory of Planned Behavior (TPB) (Ajzen, 1991), a Combined Theory of Planned Behaviour / Technology Acceptance Model (C-TPB-TAM) (Taylor and Todd, 1995), the Theory on Diffusion of Innovation (DoI) (Rogers, 1995), the Social Cognitive Theory (SCT) (Bandura, 1986), and the Model of PC Utilization (MPCU) (Thompson, Higgins and Howell, 1991). The idea behind the unification of these theories / models was based on the argument that many of the constructs of existing theories are similar in nature, therefore, it was logical to map and integrate them to create a unified theoretical basis (Venkatesh et al., 2003:446). By doing so, Venkatesh et al., (2003) hoped that future studies would need not to search, collate and integrate constructs from numerous different models but instead could just apply the UTAUT to gain an understanding of a variety of problems related to ICT adoption and diffusion.

The UTAUT theory is still a relatively new model as compared to other theories such as Ajzen and Fishbein's (1980) TRA and Rogers's DoI (1995) theories. Since its inception, UTAUT theory has had limited use in the research literature (Straub, 2009:639).

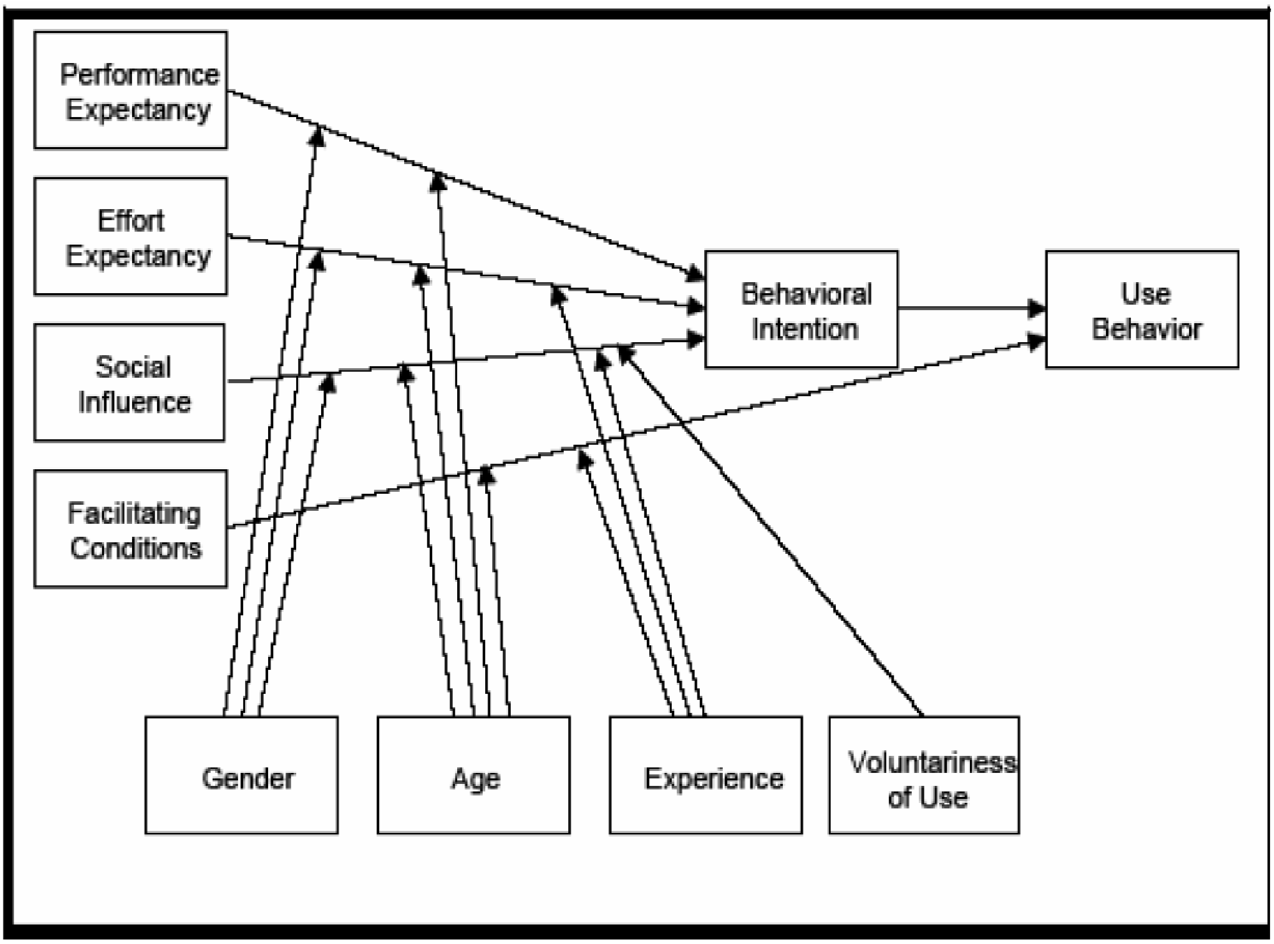


Figure 3.4: The UTAUT Model (Venkatesh et al., 2003:447)

Table 3.1 Definitions and root constructs for the four constructs (Venkatesh et al., 2003:447-451)

| Construct | Definition | Root Constructs |
|---|---|---|
| **Performance expectancy** | The degree to which an individual believes that using the system will help him or her to attain gains in performance. (Venkatesh et al., 2003:447) | 'Perceived Usefulness' from TAM and C-TAM-TPB, 'extrinsic motivation' from MM, 'Job-fit' from MPCU, 'relative advantage' from DOI, and 'Outcome expectations' from SCT. |
| **Effort expectancy** | The degree of ease associated with the use of the system (Venkatesh et al., 2003:450 | 'Perceived ease of use' from TAM, 'Complexity', from MPCU, and 'ease of use' from DOI. |
| **Social influence** | The degree to which an individual perceived that important others believe he or she should use the new system (Venkatesh et al., 2003:451) | 'Subjective norm' in TRA, TAM2, TPB and C-TAM-TPB, 'social factors' in MPCU, and 'Image' in DOI. |
| **Facilitating conditions** | The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system. | 'Perceived behavioural control' from TPB, C-TAM-TPB, 'facilitating conditions' from MPCU, and 'Compatibility' from DOI. |

## 3.8 ACADEMIC STAFF ATTITUDES TOWARDS ICT INTEGRATION

As noted above, Rogers (1995:21) puts a special emphasis on users' attitudes towards a new technology, when he argues that attitudes toward technology are the key element in its diffusion. The decision process that the person goes through while deciding on technology adoption/rejection is mainly based on the widely accepted idea that attitude affects the behaviour directly or indirectly. Ajzen and Fishbein (1980) theory also confirmed the symbiotic relationship between attitude and behavior. These attitudes, whether positive or negative, affect how academic staff responds to technologies which in turn affects students' perceptions of technology use (Teo, 2008a:1635).

Attitudes are thought to consist of three elements: An affective element, cognition and behaviour elements (Peters and Slovic, 2007:300). The affective element is related to the individual's emotional response or liking of a person or object. The cognitive element refers to the person's knowledge about a person or object, and the behavioural element is the overt behaviour directed towards a person or object. In order to have an exact understanding of one's attitude, all these elements should be taken into consideration (Ajzen and Fishbein, 1980:20; Zimbardo, Ebbeson and Maslach, 1977:23).

Early research has ignored academic staff's attitudes toward the new technology (Harper, 1987:40) and focused more on other aspects such as ICT importance in education, infrastructure and accessibility, thus overlooking the psychological and contextual factors involved in the process of educational computerization (e.g. Koo, 2008; Windschitl and Sahl, 2002). While these aspects remain important considerations, it is usually the factors that are personal and deeply ingrained, such as academic staff's attitudes towards the computer and skills (Ertmer, 1999:51) that play a big role in the way academic staff generally integrates educational technology tools into instruction. Baylor and Ritchie (2002:401), in an examination of a number of American institutions, discovered that teacher-related issues were crucial in determining ICT use in the classroom.

Researchers have found that the success or failure of any initiatives to implement technology in an education programme depends upon academic staff attitudes towards the computer, which will influence its use in the classroom (*cf*. Myers and Halpin, 2002; Isleem, 2003; Bullock, 2004; Huang and Liaw, 2005; Paraskeva, Bouta and Papagianna, 2008, Teo, 2008). Bullock (2004:212) found that academic staff's attitudes are a major enabling/disabling factor in the adoption of technology. Similarly, Huang and Liaw (2005:732) state that among the factors that affect the successful use of computers in the classroom, academic staff's attitudes towards computers play a key role. Tondeur, van Braak and Valcke (2007: 965) contend that the class use of technology is strongly affected by attitudes of academic staff toward its use.

Christensen (2002:411) based on her study conducted in the USA, states that teachers' attitudes towards computers affect not only their own computer experiences, but also the experiences of their students. It has been suggested that attitudes towards computers affect academic staff's use of computers in the classroom and the likelihood of their benefiting from training (Kluever et al., 1994:255). Researchers have proposed that positive attitudes toward computers could be important factors in helping academic staff learn computer skills and develop higher computer competence, and eventually result in their use of computers within the classroom (*cf*. Qing Zhou et al., 2010; Busch, 1995). Yildirim (2000:483) found that teachers who used computers more frequently would tend to develop positive attitudes that promoted further use of the computer in their daily teaching tasks. However, one should notice that merely positive attitudes on the part of academic staffs can in no way ensure ICT use in the classroom. Several studies reported cases in which low levels of computer integration were observed in academic staff with considerably positive computer attitudes (Kim, 2002:45; Bolandifar, Noordin, Babashamsi and Shakib, 2013:90; Capan, 2012:249). Therefore, it should be noted that having positive attitude towards computer, though is a good step, is not enough to trigger changes in classroom instructions.

## 3.9 FACTORS RELATED TO ACADEMIC STAFF'S ATTITUDES TOWARDS TECHNOLOGY

Variables that influence attitudes toward ICT integration by academic staff in classroom instruction include computer anxiety, computer attributes, cultural perceptions, computer competence and academic staff's personal characteristics such as gender, age, ethnicity, educational level, years of teaching experience and computer-training history.

### 3.9.1 Computer anxiety

Computer anxiety is defined as people's feeling of discomfort and apprehension, and fear of coping with ICT tools or uneasiness in the expectation of negative outcomes from computer-related operations (Igbaria and Parasuraman, 1989:379; Chang, 2005:715). This implies that computer anxiety affects utilization of computer-based technology and performance on tasks that involve use of computers. Behavioural manifestations of computer anxiety include: (1) avoidance of computers and the general areas where computers are located; (2) excessive caution with computers; (3) negative remarks about computers; and (4) attempts to cut short the necessary use of computers (Maurer and Simonson, 1984:7).

Several studies have demonstrated the effect of computer anxiety on computer-related behaviours (Bozionelos, 2001; Czaja et al., 2006; Kay, 2008; Agbatogun, 2010). Agbatogun (2010:63) in his study, done in Nigeria, found computer anxiety to be the strongest predictor of negative attitudes, which ultimately have a great impact on computer use in the classroom and the ability to learn to use computers. A high level of computer anxiety has been negatively related to learning computer skills (Harrington, McElroy and Morrow, 1990:350), resistance to the use of computers (Torkzadeh and Angula, 1992; Weil and Rosen, 1995), and poorer task performance (Heinssen et al., 1987:53). However, with adequate training and provision of technical support, computer skills problems can be overcome and a favourable perception will be developed (Tekinarslan, 2008:1581). Meaningful training and professional development can increase academic staff's confidence and indeed diminish these feelings of fear or anxiety.

### 3.9.2 Computer attributes

Rogers (1995:206) contends that "the perceived attributes of an innovation are an important characteristic of an innovation affecting its rate of adoption". Based on past research, Rogers (1995:15) points out five innovation attributes of technology that affect its acceptance, and the subsequent adoption of an innovation as stated earlier: relative advantage, compatibility, complexity, trialability and observability.

Researchers have long recognized the importance of considering innovation attributes in their diffusion research, and they continue to discover empirical evidence that these attributes affect new technology diffusion rates (Lee, Smith and Grimm, 2003:755) and diffusion patterns (Teng, Grover and Guttler, 2002:15). In fact, Rogers claims that at least 87% of the variance in rate (speed) of adoption is explained by these five attributes listed in his work (Rogers, 1995: 15-16). The five innovation attributes are described below.

*Relative advantage* is the degree to which an innovation is perceived as better than the idea it supersedes (Rogers, 1995:15). The degree of relative advantage may be measured in terms of economic profitability, low cost, convenience, saving time and effort and immediacy of reward. If the perceived advantage to the use of ICT in the classroom is positive, there is a greater likelihood that the academic staff will adopted and integrate it into their classroom instruction.

*Compatibility* is the “degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the potential adopters” (Rogers, 1995:15). Examples include cultural beliefs and customs, personal experiences that support or undermine some aspect of the innovation, and recognition of a need for change. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. Hoerup (2001:11) in her overview of the literature has found that each innovation influences academic staff’s opinions, beliefs, values, and views about teaching. The more compatible an innovation is with these elements, the more likely the innovation will be adopted. For example, if the academic staff finds ICT to be compatible with their current teaching styles, they will adopt it into their classroom, else they will reject it. Zhao and Frank (2003:826) contend that a technological innovation is less likely to be adopted if it deviates too much from the existing values, beliefs, and the teaching practices of the academic staff.

*Complexity* is the degree to which an innovation is perceived as difficult to understand and use (Rogers, 1995:16). Some innovations are readily understood by most members of a social system and will be adopted more easily; others are more complicated and will be adopted more slowly. The complexity of a technology affects how well it diffuses in a social system because if the technology is easy to use, more people are likely to adopt it and use it (Rogers, 1995). If an innovation is found to be too difficult to understand, it is not easily adopted (Parisot, 1995:129; Mwaura, 2004:39). For example, the academic staff might be reluctant to adopt ICT into their teaching practice if they perceive ICT to be complex or difficult to understand. Davis (1989:332) in his Technology Acceptance Model suggested that “ease of use” is an important innovation factor determining academic staff’s attitudes and subsequent acceptance of technology.

*Trialability* refers to the degree to which an innovation is experimented with or sufficiently tested prior to adoption (Rogers, 1995:16). The more an innovation is tried, the faster its adoption is. This has been noted to be particularly true for early adopters who may lack models to imitate and hence require hands-on experience with the innovation before adopting it. Finally, *observability* is the extent to which the results of an innovation are visible to others (Rogers, 1995:16). Whereas some ideas are visible and communicated to other people, other innovations are difficult to observe or to describe to others. The easier it is for academic staff to see the results of ICT use in the classroom, the more likely they are to adopt it.

This study will utilize only four computer attributes that are thought to be relevant to the participants in this study. These include relative advantage, compatibility, complexity and observability (see Questionnaire, section 4, Appendix C). Trialability was excluded because the majority of academic staff members may not have had an opportunity to experiment with computers before this study was introduced; thus the questions related to trialability were not included in the study.

Researchers have examined in a number of diffusion of innovation studies the relationship between perceived innovation attributes and adoption (Mwaura, 2004; Lee et al., 2003; Teng et al., 2002, Albirini, 2006). Albirini (2006: 382-383) found that the perception of computer attributes was significantly correlated to teachers' attitudes towards computers. Albirini's study accentuated the importance of computer attributes in the process of computer adoption in developing countries. Similar finding were also reported by Qing Zhou, Yingmin Zhao, Jiani Hu, Yang Liu and Lijuan Xing, (2010:1412) after a study done in China. Mwaura (2004:34) in her study, conducted in Ohio University found that relative advantage, compatibility and complexity were the most significant factors in predicting academic staff's intentions to make use of technology. Mwaura further suggested that the academic staff was motivated to use ICT in the classroom because of the perceived advantage that they gained from doing so. The advantages mentioned, ranged from their ability to post course materials online to easy communication with their students. In addition, the academic staff also perceived ICT to be compatible with their current teaching styles and easy to understand and use.

Sooknanan et al. (2002:568) in their study, conducted in Trinidad and Tobago, reported that relative advantage, compatibility and observability were significantly related to the teachers' attitudes towards computers. However, their results did not show a relationship between complexity and academic staff's attitudes. Mwaura (2004:39) associated a sense of complexity with a lack of familiarity with technology and a lack of training. In contrast, Tornatzky and Klein (1982:40) after their studies reported that complexity had the most significant relationships with technology adoption.

### 3.9.3 Cultural perceptions

Rogers (1995) and Thomas (1987b) emphasized the importance of the cultural/social norms of a given country in the acceptance of technology by its people. Norms are the established patterns of behaviour that tell members of the system what behaviour is expected (Rogers, 1995:26). According to Rogers, social norms can be the main barrier to change. Martinez (1999:1) found that one of the major challenges facing developing countries was to make technology an essential part of the culture of the people. For example, it has been argued (Chen, Mashhadi, Ang and Harkrider, 1999; Collis, 1999; Joo, 1999) that ICT is racially white, Western, and male 'things' and that the internet itself overtly embodies American cultural qualities in terms of its language and technical users' values. Such kinds of cultural perception may prevent academic staff, especially from non-European countries, from integrating ICT into their classroom instructions. Collis (1999:201) argues that culture is a critical factor in influencing people's acceptance and use of ICT-based learning resources; therefore, understanding people's culture and how their culture influences behaviour, attitude and thinking towards ICT integration in the classroom is important.

According to Brennan, McFennan and Law (2001:5), the diffusion of technologies may be inhibited by the individual cultural differences. Thomas (1987b:15) proposes, "how acceptable a new technology will be in a society depends on how well the proposed innovation fits the existing culture". Thomas refers to his hypothesis as the cultural suitability factor, which he places within his model of technology transfer from developed to developing countries. Harper (1987:47) contends that cultural factors play an important role in creating negative perceptions toward computers: "One direct cultural cause is people's apprehension that life is becoming too mechanized, so they resist contributing to a 'computer culture'. In spite of their importance in the success of ICT integration, Barton, Corbitt, Nguyen, and Peszynski (2007:1080) noted that few studies had considered the influence of academic staff's cultural perceptions on their adoption of technological innovation. Li and Kirkuk (2007:307) explored the effects of national culture on technology use among Chinese and British users. The researchers found that there were differences in technology experience, attitudes, usage and competence between the two nations which were related to their national cultures. Al-Oteawi (2002: 258) also, in his study conducted in Saudi Arabia found that teachers refrained from using the internet in the classroom for fear of the ethically inappropriate material on the internet. He particularly pointed to the teachers' reluctance to endorse the internet for teaching and learning "because of concerns about the evil aspects of the internet." Similar findings were also reported by Hyland (2003:2) after a study conducted at the University of Otago in Dunedin, New Zealand, where the academic staff reported their dislike of using internet to communicate with their students. To them, this form of communication was too impersonal. Modum (1998:29) notes that "cultural conservatism toward computers is responsible for the Nigerians' slow launch into the new information and communication age." He urges his people to "imbibe the values of the computer as a tool that can be used by all for problem solving, no matter their profession."

### 3.9.4 Computer competence

The success of educational innovations depends largely on the skills and knowledge of academic staff (Pelgrum, 2001:165). Academic staff's lack of computer competence is an inhibiting factor in their acceptance and adoption of ICT in the classroom (*cf.* Al-Oteawi, 2002; Albirini, 2006; Drent and Meelissen, 2008, Tezci, 2009; Son, Robb and Chatismiadji, 2012). Tezci (2009:1291) asserts that if teachers have a high level of ICT knowledge, then there will be a higher level of ICT use in the classroom. Son et al. (2012:28) argued that positive attitudes toward computers could be important factors in helping academic staff learn computer skills and use computers, therefore, computer attitudes are influenced by ICT knowledge and skills. Francis-Pelton and Pelton (1996:1) in their report on a study of the correlation between teacher attitude and the acceptance of technology maintained that although many teachers believed computers were an important component of a student's education, their lack of knowledge and experience led to a lack of confidence to attempt to introduce them into their instruction.

Mooij and Smeets (2001:266) state that if academic staff members are not confident in their ability or competence to handle computers it may hamper their willingness to introduce technology in their classrooms. Berner (2003:12) in her study conducted among faculty members from five universities in Virginia, USA, also found that the faculty members' belief in their computer competence was the greatest predictor of their use of computers in the classroom. She argues that competence is an important factor fostering favourable attitudes towards computers. This result is in compliance with the findings reported by Al-Oteawi (2002:253) in Saudi Arabia who stated that most teachers who showed negative or neutral attitudes toward the use of ICT in education lacked knowledge about and skill in computers use that would enable them to make an ‘‘informed decision’’, hence teachers’ knowledge and skills should be developed with adequate training programmes.

According to Geissler and Horridge (1993:350), both familiarity with computers and computer usage are positively related to computer knowledge. It has also been shown that, as computer skills improve, there is a commensurate improvement in managing computer applications and in performance (Reed, 1990:17).

### 3.9.5 Academic staff’s personal characteristics

Rogers (1995:26) notes that “individual innovativeness (adoption of an innovation) is affected both by an individual characteristic and by the nature of the social system in which the individuals are members”. However, Katz (1992:40) indicated that only certain personality traits are positively associated with computer attitudes. Ryckman (2004 cited in Hassanzadeh, Gholami, Allahyar and Noordin, 2012:77) described personality as a dynamic and organized set of traits possessed by an individual that uniquely affect his/her motivations, cognitions and behaviour in diverse conditions. Several studies have examined (with mixed reports) the relationship between different combinations of academic staff’s personal characteristics and their attitudes toward ICT.

#### 3.9.5.1 Gender

There are conflicting reports on the role of gender in developing attitudes towards computer use. While some studies found no direct relationship between gender and computer attitudes (Shapka and Ferrari, 2003; Birgin, Çoker and Çatlioglu, 2010; Bakr, 2011; Rana, 2012), other studies however, reported the existence of a relationship (Coffin and MacIntyre, 1999; Tezci, 2009; Kutluca, 2011). In a study conducted in Canada, Shapka and Ferrari (2003:328) reported that they did not observe any gender differences in computer-related attitudes. A similar finding was also reported by Birgin et al. (2010:1591) and Bakr (2011:315) whose studies showed no direct relationship between gender and attitudes. In contrast, both Coffin and MacIntyre (1999:550) and Tezci (2009:1291) found in their studies that males generally had more positive attitudes towards computers than did females.

Support for these findings was also reported by Blackmore et al. (1992:250) who found that males appeared to be more positive in their attitudes toward computers than females. Kotrlik and Smith (1989:41) in their study found male teachers to be more confident and less anxious toward computers compared to their female counter-parts. In fact, males were also found to have greater skills than females (Houtz and Gupta 2001:320). Moreover, there are also gender differences in how academic staff thinks about and engages with computers. Female academic staff members tend to have higher levels of computer anxiety (Rosen and Weil, 1995:22), they tend to be less confident computer users, and are more likely to place blame upon themselves when they encounter problems while working with computers than males (Lee, 1997:257). Similar to this, a finding was also reported by Chua, Chen and Wong (1999:612) who suggested that women generally were more computer anxious than men. In addition, male teachers often have more prior experience with computers (Sheffield, 1996:49) and are much more likely to implement computers into the classroom than female. Thus, although there are conflicting reports on gender, it is obvious that the situation has changed, as the more recent studies (Shapka and Ferrari, 2003; Birgin et al., 2010, Bakr, 2011; Rana, 2012) found no relationship.

### 3.9.5.2 Age

Different experiences of different age groups (young and old) may entail disparity in attitudes towards computers. This difference may be attributed in part to the recentness of the computer revolution and lack of familiarity and limited exposure to computers (Troy, Meinert and Vitell, 2013:14). Previous studies on the relationship between age and attitude produced mixed results. For example; some studies affirmed no age differences in attitudes towards computers (*cf.* Yushau, 2006; Teo 2008; Jegede, 2009), while other studies reported the existence of age differences (between young and old educators) in attitudes towards computers (*cf.* Venkatesh and Morris, 2000; Cavas, Cavas, Karaoglan and Kılsa, 2009). Yushau (2006:11) found that age was not a significant contributor towards computer attitudes. A similar finding was also reported by Jegede (2009:775), who found no significant relationship between age and computer attitudes. This result further suggested that teachers at all ages were similar in their attitudes towards the computer. However, Venkatesh and Morris (2000:122) found that young teachers had more positive attitudes toward computers than their older colleagues. Younger teachers are more knowledgeable and willing to use the computer in the classrooms than do older teachers (Ocak, 2005:85).

Varner (2003:154) also found that young teachers had more positive attitudes toward computers than their older colleagues. The same finding was reported by Cavas et al. (2009:28). Lin (2002:113) asserted that older teachers had positive attitudes toward computers if they had been given training. He concluded that no matter how old a teacher was or at which level his/her technological knowledge, he/she still may be highly motivated and maintain a positive attitude towards ICT, if he/she had received proper training. One finding by Kubeck (1999:181) indicated that older teachers tended to be more interested in learning than the younger teachers.

#### 3.9.5.3 Teaching experience

Though some research reported that teachers' experience in teaching did not influence their use of computer technology in the classroom (Niederhauser and Stoddart, 2001; Bakr, 2011), others showed that teaching experience did influence the successful use of ICT in classrooms (Sadik, 2006; Giordano, 2007; Hernandez-Ramos, 2005; Rana, 2012). Bakr (2011: 315) reported to have found no significant relationship between computer attitudes and the teaching experience among

Egyptian teachers. This finding is contrary to findings reported by Sadik (2006:108) after his study conducted, five years earlier, also in Egypt. He reported that teachers with more years of teaching experience showed more positive attitudes towards computers and were more likely to appreciate the importance of computer use in the classroom than those with less experience. Similarly, Crooks, Yang and Duemer (2003:110) found that academic staff with more years of teaching experience and those teaching at doctoral and research institution had the most favourable attitude toward using the ICT.

Gorder (2008:67) reported that academic staff's experience was found to be significantly correlated with the actual use of technology. Lau and Sim (2008:28) in their study, conducted in Malaysia, found that teachers with many years of teaching experience were more frequent user of computer technology in the classrooms than the teachers with less teaching experience. But in contrast, Huang (2003:15) found that senior teachers had less positive attitudes towards computers and were less willing to use them in their classes than did less senior, young teachers.

#### 3.9.5.4 Computer training

The application of technology could be complicated and time-consuming until it has been mastered (Barley, 1999; Parker, 1997). Successful ICT integration of technology on teaching practices requires frequent training. This training may include short courses, workshops, seminars and conferences, which will equip academic staff to learn about the pedagogically appropriate use of ICT in teaching and learning. If this training is not provided, then attempts to integrate ICT into classroom teaching will inevitably be unsuccessful. ICT-related training programmes develop academic staff's competences in computer use (Bauer and Kenton, 2005; Franklin, 2007; Wozney, Venkatesh and Abrami, 2006), and influence academic staff attitudes towards computers positively (Teo, Lee and Chai, 2008:136).

According to the USA Office of Technology Assessment (1995:130), most education leaders believe the under-utilization of technology in education is a result of, among others, inadequate educator training. Armstrong and Casement (2000:35) suggested that the first attempt to computerize classrooms in the 1970s was considered to have been largely a failure for several reasons; one of the key reasons being that so little attention was paid to academic staff training. Based on an international study involving students, educators and computers, Pelgrum and Plomp (1996 cited in Christensen, 2002: 412) concluded that:

> *Educators are the main gatekeepers in allowing educational innovations to diffuse into the classrooms. Therefore one of the key factors for effecting an integration of computers in the classroom instruction is adequate training of educators in handling and managing these new tools in their daily practices.*

This study further suggested that the degree of classroom computer use was closely tied to extent of training in ICT integration techniques. Hosman and Cvetanoska (2010:20) and Wanjala, Khaemba and Chris (2011:35) suggested that academic staff's ICT training should not be once off, instead it should be an on-going process so that learners (academic staff) could be kept up-to-date with ever-changing technologies. Pelgrum (2001: 165) in his study found that ICT integration sometimes failed in the classroom because there were not enough training opportunities for academic staff in the use of ICT in the classroom environment. Beggs (2000: 5) found that one of the top three barriers to the use of ICT in the classroom was lack of training. Similarly, Toprakci (2006:6) reported that limited academic staff training in the use of ICT in Turkey was an obstacle to its use in the classroom.

McMahon, Gardner, Gray and Mulhern (1999:304) and Gobbo and Girardi (2001:74) stated that there is a positive relationship between computer training and academic staffs' attitudes. Training can significantly influence the ways in which an academic staff member includes technology tools in the classroom. In support of the importance of academic staff's computer training, Chang Shieh and Liu (2012: 184) concluded that computer training increased academic staff's perceptions on ICT usefulness in the classroom. Whitaker and Coste, (2002:53) suggested that, if academic staff were expected to integrate ICT in the classroom, higher education institutions should strategically develop ICT integration plans that would assist them to overcome barriers, addressing the needs of diverse pedagogical agendas and multiple levels of comfort with educational technology.

#### 3.9.5.5 Educational level

Rogers (1995:35) suggests that an individual's educational level affects his/her adoption of an innovation. At that point in time, it seemed reasonable that the higher the educational level one held, the more familiarity an individual might have had with the new technologies. This may entail more positive attitudes toward ICT. This suggestion has been supported in different educational contexts. Several studies have reported a significant relationship between teachers' educational level and their attitudes toward computers (*cf*. Na, 1993; Francis, 1988; Bauer and Kenton, 2005; Agbatogun, 2010). Bauer and Kenton (2005:524) in a study done at the University of Texas found that academic staff with higher educational qualifications possessed more positive attitudes toward ICT than those with lower educational qualifications. However, such relationships did not exist in different educational contexts. For example, Qudais, Al-Adhaileh and Al-Omari (2010:139) found no relationship between educational level and academic staff's attitudes toward technology at the Jordanian universities.  This might be due to the more recentness of the study.

## 3.10 CONCLUSION

In this chapter a background for the study was presented. This background included a brief discussion on computer attitudes and ICT integration into the classroom as well as the theories behind change of attitudes towards ICT use. These theories include Rogers's theory of diffusion of innovation and Ajzen and Fishbein's theory of reasoned action (TRA). Based on the discussion above, it is clear that the successful integration and implementation of ICT depend largely on the attitudes of academic staff members, who eventually determine how it is used in the classroom. This in turn affects the way students view the importance of ICT in teaching and learning. Computer attitudes are influenced by different variables, such as computer anxiety, computer competence, cultural perceptions, perception of computer attributes, as well as personal characteristics which were also discussed. In most cases, these variables interact with one another to influence attitudes towards computers. The next chapter will present the research methodology used to carry out this investigation.

# CHAPTER 4

# RESEARCH DESIGN AND METHODOLOGY

## 4.1 INTRODUCTION

In the previous chapters, Chapter two and Chapter three, the literature studied with a view of the study was discussed. Chapter two explains the rationale behind the use of ICT in education. The chapter gave a brief account on the history of ICT development and its role in teaching and learning. Chapter three discussed ICT integration and the factors influencing ICT integration in the classroom. This chapter presents the research design and methodology that were used, as well as the research question and variables.

The past two decades have witnessed a worldwide proliferation of ICT in educational systems (Albirini, 2006: 373). This is due to the capability of ICT to transfer, collect and manage a great amount of information and to reduce space and time barriers (Carbonara, 2005:213). With ICT, a wealth of learning materials in almost every subject and in a variety of media can be accessed by all students from anywhere at any time of the day. This flexibility in terms of place and time for more independent learning, will not only better meet the needs of the students, but will also facilitate the development of new educational markets (e.g. for lifelong learning in an information society) (Haddad and Jurich, 2002: 47). South Africa, as a developing country, recognized these opportunities and in response the government has made a significant investment in ICT infrastructure development in education. These developments resulted in significant progress in ICT availability and access in South African institutions, but ICT is still not being effectively integrated into the classroom practice. Govender et al. (2010: 52) has pointed out that most institutions in South Africa have computers but not all educators are using them. This poses challenges for HEIs, technology advocates, and government agencies as a whole.

Literature suggests that the successful integration and implementation of educational technologies depends largely on the attitudes of educators, who eventually determine how ICT is used in the classroom (Jhurree, 2005, Albirini, 2006). This view is shared by Bullock (2004:212) and Birch (2009:126) who state that academic staff attitudes are a major enabling/disabling factor in the adoption of technology. Academic staff is at the forefront when it comes to influencing the teaching-learning process in the classroom. They determine who, when, where and how ICT is used in the classroom. They form the cogs of the wheel that drives the ICT integration engine, and their involvement in implementation is central to its success (Jhurree, 2005: 475). While a number of studies on academic staff attitudes and ICT integration have been conducted in developed countries, there are no reported studies investigating this topic in rural South African HEIs or even South African HEIs as a whole. This study attempts to fill this void and explore the rural South African university academic staff's attitudes towards and integration of ICT in the classroom. The impetus for this study, therefore, was to investigate the relationship between attitudes towards computer usage and ICT integration in the classroom at the QwaQwa campus of the UFS.

This study will be of significance to the academic staff, as academic staff may benefit personally by reflecting on their use of technology in the classrooms, and professional development opportunities that are available to them. The findings of this study will also help those involved in the technology implementation process plan to identify barriers as perceived by academic staff. It is hoped that decision-makers will gain insight into the future direction of the implementation of ICT in the light of the academic staff's reactions to the current integration of computers as revealed by this study.

## 4.2 STATEMENT OF RESEARCH QUESTION

As discussed above, academic staff attitudes towards computers are central to ICT integration into the classroom. Based on that, the following research question was formulated

***Do attitudes towards computer usage predict the integration of information and communication technology in the higher education sector?***

*Subsidiary questions that emerged from the above research question are:*

- What is the level of computer anxiety of the academic staff at QwaQwa campus?
- What are the attitudes of the academic staff towards ICT integration?
- What is the perception of the academic staff of computer attributes?
- What is the perception of academic staff of computer culture and ICT integration at the QwaQwa campus?
- What is the perception of the academic staff of their computer competence?

## 4.3 HYPOTHESES

Research data were collected from academic staff at the QwaQwa campus of the UFS. The data were as analysed and interpreted to test the following hypotheses (specific null hypotheses and corresponding alternative hypotheses):

***Hoa:*** Computer anxiety does not predicts ICT integration

***H1a:*** Computer anxiety predicts ICT integration

***Hob:*** Computer attitudes do not predicts ICT integration

***H1b:*** Computer attitudes predicts ICT integration

***Hoc:*** Computer attributes do not predicts ICT integration

***H1c:*** Computer attributes predicts ICT integration

***Hod:*** Computer culture does not predicts ICT integration

***H1d:*** Computer culture predicts ICT integration

***Hoe:*** Computer competence does not predicts ICT integration

***H1e:*** Computer competence predicts ICT integration

The level of significance for hypothesis testing was 0.05 (95% confidence level).

## 4.4 IDENTIFYING THE VARIABLES

Educational research often investigates the interrelationship between variables (Cohen, Manion and Morrison, 2007:528). To be able to study the relationship, the variables need to be discussed. The different forms of variables used in this study will be discussed below:

### 4.4.1 The dependent variable

ICT integration as dependent variable in this study will be operationally defined as a score on the ICT Integration scale.

### 4.4.2 The independent variables

The independent variables - attitudes towards computer usage in this study are measured by:

1. A Computer Anxiety Rating Scale

2. An Attitudes Toward Technology Scale, which determines *(*affective response, cognitive response and behavioural domains)

3. A Computer Attributes Scale which determines (relative advantage, compatibility, complexity and observability)

4. A Cultural Perceptions Scale

5. A Computer Competence Scale

### 4.4.3 The confounding variables

The following variables were considered as extraneous to the study: age, gender, ethnicity, educational level, teaching experience, and computer-training history. The confounding variables age, gender, ethnicity, educational level, teaching experience, and computer training history were accounted for by measuring them on a Biographical Questionnaire, therefore building them into the design. The confounding variables were calculated and analysed to determine their influence on the dependent variables.

## 4.5 RESEARCH DESIGN AND METHODOLOGY

An appropriate research design is essential as it determines the type of data, data collection technique and the sampling methodology. Burns and Bush (2002: 120) defined a research design as a set of advance decisions that makes up the master plan specifying the methods and procedures for collecting and analysing the needed information. This study was conducted by implementing a quantitative non experimental multivariate survey type design, due to the nature of the research hypotheses. The study was non-experimental because no attempt was made to manipulate the variables (Gray, 2009:142). A non-experimental design generally attempts to provide descriptions of real-world phenomena which are as far as possible complete, accurate and ecologically valid (i.e. true to the context they are intended to describe) (Tolmie, Muijs and McAteer, 2011:33).

The study was located within the post positivist paradigm. A post-positivist paradigm emphasizes the objectivity and quantification of phenomena in gaining knowledge (McMillan and Schumacher, 2006:31). The study is based on the post-positivist paradigm to ensure objectivity and neutrality in the search for probabilistic evidence (Polit and Beck, 2008:15). This means that the researcher searched for the prediction nature/effect of computer attitudes and ICT integration in the classroom, realizing the impediments to knowing reality with certainty. To maximize objectivity, research designs based on the post-positivist paradigm make use of numbers, statistics, structure and experimental control (McMillan and Schumacher, 2006:31). Quantitative modes of inquiry are therefore a characteristic of the post-positivist paradigm.

### 4.5.1 Sampling

The researcher intended to obtain information that is rich in terms of its contribution to the research questions stipulated in Chapter 1, Section 1.4. Based on the need to acquire this rich information, all academic staff members at the QwaQwa campus of the University of the Free State were targeted. This constituted a form of whole-frame sampling based on the principle of convenience of sample selection.

### 4.5.2 Data collection

The data collection method refers to the procedures to be used to collect data, as well as the techniques to process and analyse data (Struwig and Stead, 2001:40). In this study, the data were gathered by means of a questionnaire consisting of six scales and a Biographic Questionnaire. The questionnaire was sent to all academic staff at the QwaQwa campus of the UFS. A total of 100 questionnaires were distributed over a period of ten days from the 26 October to the 8 of November 2012.

The questionnaires were delivered in person by the researcher to each academic staff member at their respective offices. This procedure was necessary to avoid low response rate. The academic staff members were given two weeks to complete the questionnaire. Three days before the deadline, the academic staffs were reminded via email to complete the questionnaires. The questionnaires were collected in person by the researcher with a response rate of 84 per cent.

### 4.5.3 Measuring instruments

In this study, a survey questionnaire was used to gather data from the academic staff. The survey questionnaire consisted of six scales that correspond to the independent variables. These variables are operationally defined as a score on the following scales (see Appendix C):

- Computer Anxiety
- Attitudes towards Technology
- Perceived Computer Attributes
- Cultural Perceptions
- Computer Competence

The dependent variable – ICT integration was operationally defined as a score on the:

- ICT integration scale

A survey questionnaire used in this study was developed by Albirini (2006: 390-395), Heinssen and Knight (1987: 49-59) and Baatjies (2009: v). The reported Cronbach's reliability coefficients for the scales by developer were: computer anxiety = .87, computer attitude = 0.90, computer attributes = 0.86, cultural perceptions = 0.76 and computer competence = 0.94. The reliability coefficients of the scales, which were not recorded in their documentation, were calculated and are reported further on. A discussion of the instruments used follows below:

4.5.3.1 Demographic information

The demographic information questionnaire contained questions regarding the age, gender, ethnicity, educational level, teaching experience, and computer-training background of the respondents.

4.5. 3.2 Computer Anxiety Rating Scale – independent variable

The computer anxiety rating scale consisted of nineteen item on a 6-point Likert-type scale with response options ranging from ’strongly agree’ to ’strongly disagree’. An example of a statement used to measure computer anxiety is, “It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key”.

4.5. 3. 3 Attitudes toward Technology Scale – independent variable

Twenty attitude-related statements comprised the Attitude toward Technology Scale. Attitude toward Technology Scale measure the ***affective*** component of attitude (emotion or feeling of the academic staff and includes statements of likes or dislikes to ICT in education such as, “I dislike using computers in teaching”). The ***cognitive*** component of attitude (academic staff’s factual knowledge about ICT or a belief that one holds about the significance of the computers in the classroom practice, such as, “Computers save time and effort”), and the ***behavioural*** part of attitude (what academic staff actually does or intends to do regarding ICT, such as, “I would rather do things by hand than with a computer”). Attitude toward Technology Scale entails a 6-point Likert-Type scale with response options ranging from ’strongly agree’ to ‘strongly disagree’.

4.5. 3.4 Perceived Computer Attributes Scale – independent variable

Of the five innovation attributes identified by Rogers (1995:15-16), only four computer attributes, namely relative advantage, compatibility, complexity, and observability were examined by the questionnaire. Trialibility, as the fifth computer attribute, was not examined, because the majority of academic staff members in the study may not have had an opportunity to experiment with computers before this study was introduced. Therefore**,** no question that is related to trialibility was included in the study. The computer attributes consisted of eighteen items on a 6-point Likert-type scale with response options ranging from 'strongly agree' to 'strongly disagree' (Albirini, 2006: 392-393). An example of a statement used to measure computer attributes, is, "Teaching with computers offers real advantages over traditional methods of instruction" (*relative advantage)*, "Computer use fits well into my curriculum goal" (*compatibility)*, "It would be hard for me to learn to use the computer in teaching" (*complexity)*, and "Computers have proved to be effective learning tools worldwide" *(observability)*.

4.5. 3.5 Cultural Perceptions Scale – independent variable

The cultural perceptions scale consisted of sixteen items on a 6-point Likert-type scale with response options ranging from 'strongly agree' to 'strongly disagree' (Albirini, 2006: 393-394). The statements took into account the academic staff's perceptions of the cultural value, relevance, and impact of ICT as it relates to both South Africa scholastic and national cultures. An example of a statement used to measure cultural perceptions, is, "Computers will not make any difference in our classrooms, schools, or lives".

4.5. 3.6 Computer Competence Scale – independent variable

The Computer Competence Scale consisted of fifteen items on a 6-point Likert-type scale with response options ranging from 'no competence' to 'extraordinary competence'. The items focused on the common computer uses in education: software installation, basic hardware, productivity software (e.g. word processing), telecommunication resources, basic troubleshooting, graphic application, grade keeping, educational software evaluation, organization tools (e.g. use of folders), and virus handling. An example of a statement used to measure computer competence is, “I can install new software on a computer”.

#### 4.5.3.7 ICT Integration Scale – Dependent variable

The ICT integration scale consisted of ten statements on a 6-point Likert-type scale with response options ranging from ’never’ to ’always’. The ten statements about ICT integration took into account academic staff’s ability to integrate ICT into the classroom teaching and learning in general and test grading (student assessments). An example of a statement used to measure ICT integration is, “I use presentation software such as Microsoft PowerPoint to present my lessons”.

### 4.5. 4. Analysis of data

Struwig and Stead (2001:168) state that analysis of data enables the researcher to organize and bring meaning to large amounts of data. The data were coded by the Department and then captured by the Department of Information and Technology Services at the UFS. This department analysed the data quantitatively. The descriptive and inferential statistics were used to describe and summarize the data collected from the respondents. The descriptive analyses included frequency distribution, mean, percentage standard deviation, skewedness and median. Inferential statistics was used to test the hypotheses. The results are presented in Chapter 5.

## 4.6. ETHICAL CONSIDERATIONS

Cohen et al. (2007:53) and Creswell (2003:23) stress the importance of the researcher’s respect for the privacy and right to confidentiality of the respondents. No actual names of participants at whatever level of the project was made public. All data were handled confidentially and stored safely within a lockable cabinet. Furthermore, the purpose of this study was explained and the participants were informed that their participation was voluntary. It was necessary to obtain the correct and sufficient permission to conduct the research within the university. Permission to conduct the study was obtained from the academic head at the QwaQwa campus of the UFS (Appendix A). Ethical clearance was obtained from the Faculty of Education's Ethical Committee after the research proposal together with all the required documents explaining the nature of the research project, that is, the questionnaires and consent forms regarding participation, were prepared and submitted for approval. On completion of the study, the results and findings will be made available to top management.

## 4.7. RELIABILITY AND VALIDITY OF THE RESEARCH

The reliability and validity of the research form an important part of the research design and are discussed below.

### 4.7. 1. Reliability

The reliability of a study is dependent on the reliability of the measuring instruments. Gay and Airasian (2000:169) state that,"Reliability is the degree to which a test consistently measures whatever it is supposed to measure". Although there are several types of reliability, the most widely used one is internal-consistency reliability, often reported in Cronbach's alpha (Maxwell and Delany, 2004:25). Thus, the internal-consistency reliability coefficients in Cronbach's alpha in this study were established using the pilot study data. Cronbach's alpha estimates internal-consistency reliability by finding out how items of an instrument relate to each other and to the total instrument (Gay and Airasian, 2000:170). Cronbach's alpha was calculated via the statistical package. The polarity of the negative questions in the Likert-type scales was reversed. This reversed polarity was used for subsequent analyses. Obtained Cronbach's alphas from the pilot study and the actual study are reported in Table 4.1. In judging the goodness of an internal consistency reliability coefficient, Garson (2008, cited in Yasin, Taib and Zaki, 2011:1441), and Cohen et al. (2010:506) suggest that an instrument is acceptable for research purposes when its reliability, using Cronbach's alpha, is more than .70. These criteria served as the guidelines in interpreting the internal consistency-reliability coefficients in the study.

The pilot study was done to determine if the questionnaire items were understandable for the participants and if the internal consistency reliabilities were satisfactory. The pilot study was administered to twenty-one academic staff members. Participants were given the opportunity to make constructive suggestions or comments regarding the instrument. They did not report having difficulties responding to the questions, and suggested their satisfaction with the questions. The response rate for the pilot study was 100 per cent.

**Table 4.1: Cronbach's coefficient alpha values of measuring instruments**

| Scale | No. of Main Study Items | Standardized Cronbach's Alpha | |
|---|---|---|---|
| | | Pilot (n = 21) | Study (n = 100) |
| Computer Anxiety | 19 | .88 | .79 |
| Attitude toward ICT | 20 | .90 | .85 |
| Computer Attributes | 18 | .88 | .81 |
| Cultural Perceptions | 16 | .87 | .61 |
| Computer Competence | 14 | .87 | .95 |
| ICT Integration | 10 | .78 | .79 |

### 4.7. 2. Validity

Fraenkel and Wallen (2008:147) state that "…validity refers to the appropriateness, meaningfulness, correctness and usefulness of the inferences a researcher makes". Two types of validity exist, namely internal and external validity. Internal validity means that the results of the study were due to the effect of the independent variable on the dependent variable and not due to the effect of the confounding variable on the dependent variable. In this case the confounding variables were measured and built into the design according to the MaxMinCon principle (McMillan and

Schumacher, 2006:118). The effect of the confounding variables was thus controlled. Internal validity is also determined by compiling the correct statistical analysis which in the case of this study was done by a professional.

External validity refers to the extent to which results of the research can confidently be generalized to the population from which the sample was selected (Kerlinger, 1986:300; Maas, 1998:24). This study's results, however, cannot be generalised to other universities, because random representation of other universities was not present in the sample.

## 4.8 CONCLUSION

In this chapter, the concepts of the research that were introduced in Chapter 1 have been discussed in detail. The chapter presented the methodological design and procedures used in study. The chapter also explained how the researcher addressed issues of ethics, validity and reliability. That was done because it is reported that understanding the various components of research and their interrelated nature is essential in conducting valid research and deducting the findings from the study. The next chapter (Chapter 5) will focus on the data analysis, and the results will be presented, interpreted and discussed.

# CHAPTER 5

# RESULTS AND DISCUSSION OF RESULTS

## 5.1 INTRODUCTION

The primary aim of this research was to determine whether attitudes towards computer usage predict ICT integration in the classroom at the QwaQwa campus of the University of the Free State. The objective of the statistical analysis of the data was to determine the relationship between the independent variables (computer anxiety, attitudes towards ICT, computer attributes, cultural perceptions and computer competence) and the dependent variable (ICT integration), while adjusting for the confounding variables (age, gender, ethnicity, educational level, teaching experience, and computer training history). The findings of the analysis are discussed below.

For the purpose of this study, the concept *“attitudes toward ICT”* used in the tables for different variables in this chapter (chapter 5) will be interchangeably with the concept *“computer attitude”.*

## 5.2 RELIABILITY OF THE MEASURING INSTRUMENT

Reliability or internal consistency was measured by means of Cronbach’s alpha. The obtained Cronbach’s alpha from the study is reported in Table 5.1. Cohen, Manion and Morrison (2010:506) give the following guideline for the alpha value:

“>0.90 – very/highly reliable

0.80-0.90- highly reliable

0.70-0.79- reliable

0.60-0.69- marginally/minimally reliable

< 0.60- unacceptable low reliability”

These criteria served as the guidelines in interpreting the internal consistency and reliability coefficients in the study.

**Table 5.1: Report of reliability analysis of the study**

| Scale | No. of Main Study Items | Standardized Cronbach's Alpha |
|---|---|---|
| | | Study (n = 84) |
| Computer Anxiety | 19 | .79 |
| Attitude toward ICT | 20 | .85 |
| Computer Attributes | 18 | .81 |
| Cultural Perceptions | 15 | .61 |
| Computer Competence | 14 | .95 |
| ICT Integration | 10 | .79 |

## 5.3 DESCRIPTIVE STATISTICS: CHARACTERISTICS OF THE SAMPLE

The sample characteristics of the confounding variables (gender, ethnicity, academic rank, educational level, computer training, age, teaching experience and years of ICT use in class) will be discussed below. First, the categorical confounding variables (gender, ethnicity, academic rank, educational level and computer training) will be presented, followed by the continuous confounding variables (age, teaching experience in years, time on computer, training in days, and years of ICT use in class).

### 5.3.1 Descriptive statistics: Categorical confounding variables

In this section, the categorical confounding variables (gender, ethnicity, academic rank, educational level and computer training) will be discussed.

#### 5.3.1.1 Gender

As shown in Table 5.2, the sample size for this result is 84. Of the 84 respondents who indicated their gender on the questionnaire, 61 (72.62%) of the respondents were male while 23 (27.38%) were females.

**Table 5.2: Gender distribution of the respondents in the sample (n=84)**

| Gender | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|
| Male | 61 | 72.62 | 61 | 72.62 |
| Female | 23 | 27.38 | 84 | 100.00 |

#### 5.3.1.2 Ethnicity

As shown in Table 5.3, the sample size for this result is 82 because two of the 84 respondents did not indicate their ethnicity. Of the 82 respondents who indicated their ethnicity, 57 (69.51%) were black, 20 (24.39%) were white, 1 (1.22%) was coloured and 4 (4.88%) were Indian/Asian. This indicates that the majority of the respondents who participated in the study were black followed by white, coloured and Indian/Asian.

**Table 5.3: Ethnic distribution of the respondents in the sample (n=82)**

| Ethnicity | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|
| Black | 57 | 69.51 | 57 | 69.51 |
| White | 20 | 24.39 | 77 | 93.90 |
| Coloured | 1 | 1.22 | 78 | 95.12 |
| Indian/Asian | 4 | 4.88 | 82 | 100.00 |

Frequency Missing = 2

5.3.1.3 Academic rank

Table 5.4 indicates the findings regarding the respondents' academic rank. The sample size for this result was 84. Of the 84 respondents who indicated their academic rank, 1 (1.19%) was a principal, 6 (7.14%) were heads of department (HoDs), 13 (15.48%) were senior lecturers, 36 (42.86%) were lecturers, 21 (25%) were junior lecturers and 7 (8.33%) were assistants. This shows that the majority of the academic staff was at lecturer rank.

**Table 5.4: Academic rank distribution of the respondents in the sample (n=84)**

| Academic Rank | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|
| Principal | 1 | 1.19 | 1 | 1.19 |
| Head of Department | 6 | 7.14 | 7 | 8.33 |
| Senior Lecturer | 13 | 15.48 | 20 | 23.81 |
| Lecturer | 36 | 42.86 | 56 | 66.67 |
| Junior Lecturer | 21 | 25.00 | 77 | 91.67 |
| Assistant | 7 | 8.33 | 84 | 100.00 |

5.3.1.4 Educational level

As indicated in Table 5.5, the sample size for this result was 83 because one of the 84 respondents did not indicate his/her educational level. Of the 83 respondents who indicated their educational level, 4 (4.82%) had a degree, 19 (22.89%) had an honours degree, 37 (44.58%) had master's degrees and 23 (27.71%) had a PhD. This indicates that the majority of the academic staff held master's degrees, followed by PhDs.

**Table 5.5: Educational level distribution of the respondents in the sample (n=83)**

| Educational level | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|
| Degree | 4 | 4.82 | 4 | 4.82 |
| Honours Degree | 19 | 22.89 | 23 | 27.71 |
| Master's Degree | 37 | 44.58 | 60 | 72.29 |
| PhD | 23 | 27.71 | 83 | 100.00 |

Frequency Missing = 1

5.3.1.5 Computer training (information regarding background in computer training)

The sample size for this finding was 83 because one of the 84 respondents did not indicate the type of computer training they had had over the past five years (as shown in Table 5.6 below). Of the 83 respondents who indicated the type of computer training they recorded over the past five years, 5 (6.02%) reported that they had received no computer training, 37 (44.58%) had self-taught training, 26 (31.33%) reported to have had short-course training, and 15 (18.07%) reported to have had formal training. This shows that the majority of the respondents had self-taught training. Self-taught training in this study is defined as the participants' using new software and exploring the functions and practicality in an informal setting. They might have asked their friends questions or read the manuals without enrolling in any computer classes. Formal training, on the other hand, consisted of seminars, computer classes and workshops, held either on campus or outside the campus. The formal type of training was class-based training, facilitated by a professional trainer (with good computer skills and knowledge). Participants were provided with much needed support and assistance in relation to computer use.

**Table 5.6: Computer training distribution of the respondents in the sample (n=83)**

| Type of computer training over the last five years | Frequency | Percent | Cumulative Frequency | Cumulative Percent |
|---|---|---|---|---|
| None | 5 | 6.02 | 5 | 6.02 |
| Self-Taught | 37 | 44.58 | 42 | 50.60 |
| Short Course | 26 | 31.33 | 68 | 81.93 |
| Formal Training | 15 | 18.07 | 83 | 100.00 |

Frequency Missing = 1

### 5.3.2 Descriptive statistics: Continuous confounding variables (age, teaching experience in years, time on computer training in days, and years of ICT use in class)

As shown in Table 5.7, the following variables were regarded as confounding variables because of their anticipated effect on ICT integration: age, teaching experience, time spent on computer training, and years of ICT use in class. All five are continuous variables. The statistics indicate that age (youngest and oldest) has a median of 41.00, teaching experience (longest and shortest time in profession) a median of 7.00, computer training in days (1500 days) a median of 1.00, and years of ICT use in class a median of 4.50.

**Table 5.7: Continuous confounding variables distribution of the respondents**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median |
|---|---|---|---|---|---|---|
| Age | 79 | 41.57 | 11.22 | 21.00 | 68.00 | 41.00 |
| Teaching experience in years | 75 | 10.64 | 10.48 | 0.00 | 42.00 | 7.00 |
| Time on computer training in days | 84 | 29.06 | 166.03 | 0.00 | 1500.00 | 1.00 |
| Years of ICT use in class | 82 | 4.93 | 4.11 | 0.00 | 20.00 | 4.50 |

### 5.3.3 Descriptive statistics: Independent variables

The means procedures for the following independent variables (computer anxiety, computer attitude, computer attributes, cultural perceptions and computer competences) will be discussed below.

#### 5.3.3.1 Computer anxiety

Participants were asked to respond to 19 Likert-scale type statements dealing with their level of computer anxiety. The number of the respondents who responded to the questionnaire is 84. The computer anxiety levels of the respondents are reflected in Table 5.8 below. The mean of the computer anxiety is 93.06 and the median is 94.00. The mid-point of this equal interval scale is 57. The median of 94.00 is higher than the mid-point of 57, which could have indicated that the sample had a high computer anxiety. However, according to the value of the skewedness (-0.37) the distribution of these scores is normal (Brown, 2013:3). Brown suggested the following guidelines for interpreting skewedness:

- If skewedness is less than -1 or greater than +1, the distribution is highly skewed.
- If skewedness is between -1 and -½ or between +½ and +1, the distribution is moderately skewed.
- If skewedness is between -½ and +½, the distribution is approximately symmetric.

These criteria served as the guidelines in interpreting the skewedness in the distribution.

**Table 5.8: Computer anxiety of the respondents in the sample (n=84)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| Computer Anxiety | 84 | 93.06 | 11.32 | 64.00 | 113.00 | 94.00 | -0.37 |

5.3.3.2 Computer attitude

Participants were asked to respond to 20 Likert-scale type statements dealing with computer attitude. The sample size for this finding was 84. Table 5.9 below illustrates the means procedure of the respondents to the 20-item Attitude towards Technology Scale. The mean value score for computer attitude was found as 100.75 and the median was 105.50. The mid-point of this equal interval scale is 60. The median of 105.50 is higher than the mid-point of 60, which could have indicated that the sample had a high computer attitude. According to the value of the skewedness (-1.41) the distribution is highly negatively skewed indicating that a large proportion of the respondents scored high on the scale.

**Table 5.9: Computer attitudes of the respondents towards ICT (n=84)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| Attitude Towards ICT | 84 | 100.75 | 16.31 | 39.00 | 120.00 | 105.50 | -1.41 |

5.3.3.3 Computer attributes

Participants were asked to respond to 18 Likert-scale type statements dealing with their perceptions about computer attributes. The sample size for this result was 83 because one of the respondents did not indicate his/her perception of computer attributes. Table 5.10 below illustrates the descriptive statistics calculated from the responses on the 18-item Computer Attributes Scale. The mean value score for computer attributes was found as 88.06 with a median of 90.00. The mid-point of this equal-interval scale is 54. The median of 90.00 is higher than the mid-point of 54 which could have indicated that the sample had a high perception of computer attributes. However, according to the value of the skewedness (-0.77) the distribution of this scores is normal.

**Table 5.10: Computer attributes of the respondents in the sample (n=83)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| Computer Attributes | 83 | 88.06 | 11.16 | 60.00 | 103.00 | 90.00 | -0.77 |

Frequency Missing = 1

5.3.3.4 Cultural perception

Participants were asked to respond to 15 Likert-scale type statements dealing with their perceptions about computers' cultural relevance to and impact on the South African society and education. The sample size for this finding was 83 because one of the respondents did not indicate his/her perception about computers' cultural relevance. Table 5.11 below illustrates the descriptive statistics of the respondents' responses. The mean score on the cultural perceptions was 19.40 and the median 20.00. The mid-point of this equal-interval scale is 54. The median of 20.00 is lower than the mid-point of 45 which could have indicated that the sample had a low perception of computers' cultural relevance. However, according to the value of the skewedness (-0.34), the distribution of this scores is normal.

**Table 5.11: Cultural perception of the respondents (n=83)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| Cultural Perception | 83 | 19.40 | 2.99 | 12.00 | 26.00 | 20.00 | -0.34 |

Frequency Missing = 1

5.3.3.5 Computer competence

Participants were asked to respond to 14 Likert-scale type statements dealing with their perceptions about their level of computer competence. The sample size for this result was 82 because two of the respondents did not indicate their level of computer competence. Table 5.12 below shows the descriptive statistics of academic staff responses. The mean score of the academic staff responses on their level of computer competence was 60.41 and the median was 62.00. The mid-point of this equal-interval scale is 42. The median of 62.00 is higher than the mid-point of 42 which could have indicated that the sample had a high computer competence. However, according to the value of the skewedness (-0.97) the distribution is moderately skewed, indicating that the large proportion of the respondents scored moderately on the scale.

**Table 5.12: Computer competence of the respondents (n=82)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| Computer Competence | 82 | 60.41 | 14.67 | 0.00 | 84.00 | 62.00 | -0.97 |

Frequency Missing = 2

### 5.3.4 Descriptive Statistics: Dependent Variables

The means procedures for the following dependent variable (ICT integration) will be discussed.

5.3.4.1 ICT Integration

Participants were asked to respond to 10 Likert-scale type statements dealing with their level of ICT integration in classroom instruction. The sample size for this result was 82 because two of the respondents did not indicate their level of ICT integration in classroom instruction. Table 5.13 below shows the descriptive statistics of academic staff responses. The score obtained for the questionnaire completed by the respondents in the sample varies between 21 and 60. The mean score obtained is 45.02 and the median score is 45.50. The mid-point of this equal interval scale is 30. The median of 45.50 is higher than the mid-point of 30 which could have indicated that the sample had a high level of ICT integration. However, according to the value of the skewedness (-0.64) the distribution of these scores is normal.

**Table 5.13: ICT Integration in classroom instruction of the respondents (n=82)**

| Variable | N | Mean | Standard Deviation | Minimum | Maximum | Median | Skewedness |
|---|---|---|---|---|---|---|---|
| ICT Integration | 82 | 45.02 | 8.67 | 21.00 | 60.00 | 45.50 | -0.64 |

Frequency Missing = 2

## 5.4 INFERENTIAL STATISTICS

### 5.4.1 Full-model linear regression

A stepwise-model selection regarding the relationship of ICT integration (dependent variable) and the independent variables (computer anxiety, computer attitude, computer attributes, cultural perception and computer competence) was analysed using an Analysis of Covariance (ANCOVA). The F-statistics and associated p-values were calculated for each variable in the model. The summary of full-model linear regression results is presented in Table 5.14. After the presentation of this full model, stepwise model selection was applied by removing, one at a time, the variable that was least significant associated with the dependent variable (provided that the p-value was at least 0.1).

**Table 5.14: Results of full-model linear regression with ICT integration as dependent variable**

| Source | Degree of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 5 | 2681.550756 | 536.310151 | 11.94 | < .0001 |
| Error | 75 | 3368.251713 | 44.910023 | | |
| Corrected Total | 80 | 6049.802469 | | | |

| R-Square | Coefficient Variable | Root MSE | ICT Integration Mean |
|---|---|---|---|
| 0.443246 | 14.90857 | 6.701494 | 44.95062 |

| Source | Degree of Freedom | Type 111 SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Computer Anxiety | 1 | 3.2910598 | 3.2910598 | 0.07 | 0.7874 |
| Attitude towards ICT | 1 | 3.8381743 | 3.8381743 | 0.09 | 0.7708 |
| Computer Attribute | 1 | 182.8799566 | 182.8799566 | 4.07 | 0.0472* |
| Cultural Perception | 1 | 415.6933860 | 415.6933860 | 9.26 | 0.0032* |
| Computer Competence | 1 | 993.6671230 | 993.6671230 | 22.13 | <.0001* |

Note: * variables that predict ICT integration in the classroom

According to Table 5.14, three variables affect ICT integration in the classroom at the 0.05 level of significance. These variables are *computer attributes* (p=0.0472), *cultural perceptions* (p=0.0032) and *computer competence* (p=<0.0001). Computer anxiety (p=0.7874) and computer attitude (p=0.7708) were not significant predictors of ICT integration. These variables will be discussed below.

5.4.1.1 Computer anxiety

As indicated in Table 5.14, computer anxiety does not predict ICT integration in the classroom since a p-value of 0.7874 obtained was higher than the 0.05 level of significance. This is a deviation from the findings of previous studies that have found computer anxiety to be significant factors affecting ICT use in the classroom (Bozionelos, 2001; Czaja et al., 2006; Kay, 2008; Huang and Liaw, 2005; Uslu and Bümen, 2012; Van Reijswoud, 2009), but concurs with the findings of Tekinarslan (2008:1581), who postulates that more exposure to ICT will lead to less computer anxiety. The researcher concludes that the institution under study's effort in providing support (through the e-learning department) and exposing academic staff to the technology (availability of and accessibility to computers and ICT equipment) may have led to less computer anxiety.

5.4.1.2 Computer attitude

According to Table 5.14, computer attitude is not significant predictor of ICT integration. This is so because the p-value of 0.7708 obtained was higher than the 0.05 level of significance. This is in contrast to previous studies that indicate computer attitude to be a significant factor affecting the use of ICT in the classroom (Bozionelos, 2001; Czaja et al., 2006; Kay, 2008; Bullock, 2004; Albirini, 2006).

The difference in the findings regarding computer attitude may be attributed to the infrequent use of computers in classroom instructions. Yildirim (2000:483) stated that teachers who used computers more frequently would tend to develop positive attitudes that promote computer use in the classroom. Davis (1989:332) in his Technology Acceptance Model suggested that “perceived ease of use and perceived usefulness” were important innovation factors, determining academic staff’s attitudes and subsequent acceptance of technology. However, one should notice that high score on computer attitude on the part of academic staff alone can in no way ensure ICT use in the classroom. Several studies have reported cases in which low levels of computer integration were observed among academic staff with considerably positive computer attitudes (Kim, 2002; Bolandifar et al., 2013:90). Kim (2002:45) ascribes this inconsistency to a bunch of constraints, including lack of time, insufficient knowledge and confidence deficiency.Therefore it may be said that even though academic staff may have a high score on computer attitude, they may still not integrate ICT into their classroom instruction if they do not think that it will be useful or easy to use.

5.4.1.3 Computer attributes

As indicated in Table 5.14, the impact of computer attributes on ICT integration is significant since p-value of 0.0472 was obtained. Computer attributes which is the third most significant predictor of ICT integration in the classroom supports Rogers' theory on diffusion of innovation (1995:2), which contends that the attributes of the technology itself play a major role in determining its acceptability. An examination of individual computer attributes shows that respondents were more positive about the relative advantage (the benefit) of computers as an educational tool. The positive and significant contribution of relative advantage that was found in this study is consistent with previous research findings involving technology acceptance (Mwaura, 2004:34; Sooknanan et al., 2002:568). This finding is not surprising, because one would always expect that the benefits of ICT will have a strong influence on the amount of usage.

#### 5.4.1.4 Cultural perceptions

According to the results indicated in Table 5.14, the impact of cultural perceptions on ICT integration is significant since p-value of 0.0032 was obtained. Cultural perception which is the second most significant predictor of ICT integration in the classroom concur with supposition that social norms play a vital role in determining the rate of an innovation's adoption (Rogers, 1995:26). This conclusion points to the need for considering cultural factors in studies conducted in developing countries.

#### 5.4.1.5 Computer competence

According to the results shown in Table 5.14, computer competence is the most significant predictor of ICT integration in the classroom since p-value of <0.0001 was obtained. In this study, the identification of computer competence as the most significant predictor of ICT integration in the classroom supports the theoretical and empirical arguments made about the importance of computer competence in ICT integration (Pelgrum, 2001; Al-Oteawi, 2002; Berner, 2003; Albirini, 2006). Moreover, the finding confirms Rogers's Innovation Process theory which states that knowledge (the first stage in the innovation decision process) is an important factor influencing technology adoption.

5.4.1.6 Results

According to Table 5.14, the $R^2$ value of 0.44 indicates that 44 per cent of the variance in ICT integration is determined by computer anxiety, computer attitude, computer attributes, cultural perception and computer competence. This percentage is significant at P = <.0001. So in part all the independent variables predict ICT integration. However the step-wise model selection below will further delineate these relationships.

Table 5.15 and Table 5.16 demonstrate the stepwise-model selection where the variables, computer anxiety and computer attitude, were removed since the p-values of 0.7874 and 0.7708 obtained respectively were not less than the 0.05 level of significance.

**Table 5.15: The stepwise-model selection where the variable, computer anxiety, was removed**

| Source | Degree of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 4 | 2678.259697 | 669.564924 | 15.09 | < .0001 |
| Error | 76 | 3371.542773 | 44.362405 | | |
| Corrected Total | 80 | 6049.802469 | | | |

| R-Square | Coefficient variable | Root MSE | ICT Integration Mean |
|---|---|---|---|
| 0.442702 | 14.81740 | 6.660511 | 44.95062 |

| Source | Degree of Freedom | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Attitude towards ICT | 1 | 6.986216 | 6.986216 | 0.16 | 0.6926 |
| Computer Attribute | 1 | 192.387846 | 192.387846 | 4.34 | 0.0407 |
| Cultural Perception | 1 | 421.222943 | 421.222943 | 9.50 | 0.0029 |
| Computer Competence | 1 | 1111.726449 | 1111.726449 | 25.06 | <.0001 |

According to Table 5.15, the independent variable, namely computer attributes, cultural perception and computer competence formed part of the final model. According to this model, computer attributes, cultural perception and computer competence were significant predicting factors, since p-values of 0.0407, 0.0029 and

<.0001 obtained respectively were less than the 0.05 level of significance. The $R^2$ value of 0.443 indicates that 44.3 per cent of the variance in ICT integration can be explained by the three variables of computer attributes, cultural perception and computer competence. The significance value (P = <.0001) of computer competence in stepwise-model selection indicates computer competence to be the most important predictor of ICT integration in classroom instruction.

**Table 5.16: The stepwise-model selection where the variable, computer attitudes, was removed**

| Source | Degree of Freedom | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Model | 3 | 2671.273480 | 890.424493 | 20.29 | < .0001 |
| Error | 77 | 3378.528989 | 43.877000 | | |
| Corrected Total | 80 | 6049.802469 | | | |

| R-Square | Coefficient variable | Root MSE | ICT Integration Mean |
|---|---|---|---|
| 0.441547 | 14.73611 | 6.623972 | 44.95062 |

| Source | Degree of Freedom | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| Computer Attribute | 1 | 347.686440 | 347.686440 | 7.92 | 0.0062 |
| Cultural Perception | 1 | 487.110690 | 487.110690 | 11.10 | 0.0013 |
| Computer Competence | 1 | 1110.265479 | 1110.265479 | 25.30 | <.0001 |

Table 5.16 illustrates the result of the model after computer attitudes as variable was removed. From the four independent variables entered, only three variables were significant and included in the model at the 0.05 level of significance. These were computer attributes, cultural perception and computer competence with a p-values of 0.0062, 0.0013 and <.0001 obtained respectively. According to this model, computer competence was the most significant predictor of the three.

The $R^2$ value of 0.442 indicates that 44.2 per cent of the variance in ICT integration can be explained by the three variables of computer attributes, cultural perception and computer competence. Computer competence in this result is again the most important predictor of ICT integration in classroom.

In the next section, the individual relationship between the different confounding variables as well as the different independent variables and ICT integration in the classroom will be discussed now.

### 5.4.2 Univariate analysis of covariance (ANCOVA) of ICT integration in the classroom against confounding variables and independent variables

**Table 5.17: ANCOVA – ICT integration against all confounding and independent variables**

| Source | Degree of Freedom | Type 111 SS | Mean Square | F-Value | Pr > F |
|---|---|---|---|---|---|
| Age | 1 | 20.6278113 | 20.6278113 | 0.84 | 0.3832 |
| Gender | 1 | 22.8186368 | 22.8186368 | 0.93 | 0.3601 |
| Ethnicity | 2 | 51.9058388 | 25.9529194 | 1.06 | 0.3868 |
| Academic rank | 5 | 132.3599865 | 26.4719973 | 1.08 | 0.4328 |
| Educational level | 3 | 132.4771630 | 44.1590543 | 1.80 | 0.2173 |
| Teaching experience in years | 1 | 30.1319862 | 30.1319862 | 1.23 | 0.2966 |
| Time on computer training | 1 | 6.0557268 | 6.0557268 | 0.25 | 0.6313 |
| Years of ICT use in class | 1 | 1.8235101 | 1.8235101 | 0.07 | 0.7913 |
| Type of computer training over the last 5 years | 1 | 4.7958805 | 4.7958805 | 0.20 | 0.6689 |
| Computer Anxiety | 1 | 8.9450655 | 8.9450655 | 0.36 | 0.5609 |
| Attitude towards ICT | 1 | 29.9221452 | 29.9221452 | 1.22 | 0.2982 |
| Computer Attribute | 1 | 0.4721446 | 0.4721446 | 0.02 | 0.8927 |
| Cultural Perception | 1 | 108.9364629 | 108.9364629 | 4.44 | 0.0644 |
| Computer Competence | 1 | 476.6306545 | 476.6306545 | 19.42 | 0.0017 |

According to Table 5.17, the p-values of age (0.3832), gender (0.3601), ethnicity (0.3868), academic rank (0.4328), educational level (0.2173), teaching experience in years (0.2966), time on computer training (0.6313), years of ICT use in class (0.7913), and type of computer training over the past five years (0.6689) are not statistically significant at a $p< 0.05$ level of significance. This means that there is no significant relationship between age and ICT integration, gender and ICT integration, ethnicity and ICT integration, academic rank and ICT integration, educational level and ICT integration, teaching experience in years and ICT integration, time on computer training and ICT integration, years of ICT use in class and ICT integration and computer training in years and ICT integration. This suggests that academic staff has similar perception about ICT use in the classroom, irrespective of their age, gender, ethnicity, academic rank, educational level, teaching experience, time on computer training, years of ICT use in class or type of computer training. These findings are consistent with that of Albirini (2006:385). Thus, it can be said that personal characteristics are fast becoming an element not to consider when studying technology usage. This could be due to the fact that technology is now part of almost every aspect of modern life. Teo (2008b:420) suggested that the more widespread use of computers by almost every member of the society has made the difference insignificant.

Regarding the relationship of independent variables (computer anxiety, computer attitude, computer attributes, cultural perception and computer competence) with dependent variable (ICT integration) while controlling for the confounding variables, the result show only computer competence to be a significant predictor of ICT integration in the classroom at a 0.05 level of significance, since the p-value of 0.0017 was obtained. However, in the full-model regression analysis, computer attributes, cultural perceptions and computer competences did predict ICT integration in the classroom. The differences in the analysis could be attributed due to the interrelationship of variables. For example, In a full-model regression analysis, the effect of independent variables (computer anxiety, computer attitudes, computer attributes, cultural perception and computer competence) to dependent variable (ICT integration) were determined while in ANCOVA, the effect of independent variables and confounding variables (age, gender, ethnicity, educational level, teaching experience, and computer training history) to dependent variables were determined. Although none of the confounding variables was significantly related to ICT integration, their interactive effect diminishes the significance of all independent variables including computer competence.Therefore, this study chooses not to discard the effect of computer attributes and cultural perceptions on ICT integration and they will be taken up in the acceptance or rejection of the null hypothesis

## 5.5 SUMMARY OF THE FINDINGS

As stated in 1.5, the aim of this research was to determine whether attitudes towards computer usage predict ICT integration in the classroom. To be able to do this, the characteristics of the sample descriptive statistics were applied to provide a picture of the confounding, independent and dependent variables. Thereafter, inferential statistics were applied. First, a full-model regression analysis was conducted. This was done to determine the relationship of the independent variables to ICT integration. The results of the full-model regression analysis (see page 71) indicate that, on a P = <.0001 level of significance (according to the statistical analysis plan), the independent variables (computer attributes, cultural perception and computer competence) proved to be significant factors in ICT integration in the classroom. Computer anxiety and computer attitude were not significantly related to ICT integration in the classroom.

After the full-model regression analysis was performed, univariate analysis of covariance (ANCOVA) was conducted to determine whether significant relationships exist between the individual variables (confounding and independent) and ICT integration in the classroom.

The results of the ANCOVA (see page 76) regarding the confounding variables of age, gender, ethnicity, academic rank, educational level, teaching experience in years, time on computer training, years of ICT use in class, and type of computer training are not significantly related to ICT integration in the classroom.

The results of the ANCOVA of independent variables (computer anxiety, computer attitude, computer attributes, cultural perception and computer competence) indicate only computer competence to be a significant predictor of ICT integration in the classroom at a 0.05 level of significance, since the p-value of 0.0017 was obtained. Computer anxiety, attitude towards ICT, computer attributes and cultural perception were not significantly related to ICT integration since the p-values of 0.5609, 0.2982, 0.0644 and 0.8927 were obtained respectively. This result differ with the results of the full-model regression analysis which indicate computer attributes, cultural perception and computer competence as a predictor of ICT integration in the classroom. The difference could be due to the interaction of the variables hence the their (computer attributes and cultural perceptions) effect on ICT integration will be taken up in the acceptance or rejection of the null hypothesis.

In conclusion, Table 5.18 presents a summary of the hypotheses that have been accepted and rejected for the purposes of the study. The next chapter will focus on the conclusion, limitations and recommendations of the research study.

**Table 5.18: Summary of null hypotheses accepted and rejected at a 0.05 level of significance**

| Null hypotheses accepted | Null hypotheses rejected |
|---|---|
| Hoa: Computer anxiety does not predicts ICT integration | H1c: Computer attributes predicts ICT integration |
| Hob: Computer attitudes does not predicts ICT integration | H1d: Cultural perceptions predicts ICT integration |
| | H1e: Computer competence predicts ICT integration |

## 5.6 CONCLUSION

In this chapter, the findings of the statistical analysis were interpreted and conclusions were drawn. Statistical analysis was done in accordance with the sequence of questions in questionnaires. Firstly, the descriptive analysis of the confounding variables (age, gender, ethnicity, educational level, teaching experience, and computer training history), the independent variables (computer anxiety, computer attitude, computer attributes, cultural perception and computer competence) and the dependent variable (ICT integration) were presented. This is followed by the inferential analysis. From these results, the researcher can make a conclusion that computer attitude does not predict ICT integration in the classroom.

The next chapter presents the conclusions, limitations and recommendations of the research study.

# CHAPTER 6

# CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

## 6.1 INTRODUCTION

Goddard (2002:19) commented as follows on ICT integration (or rather the lack thereof) in education in the USA: “All across America blank computer screens stare out at teachers, and the teachers stare back”. Higher education institutions worldwide are investing heavily in technology to enhance teaching. However, this investment has yielded little benefit as inclusive ICT use in the classroom is not yet to be seen often. This study endeavoured to address this challenge. As indicated in Chapter 1 (1.3), for the past number of years, many HEIs in South Africa have spent much of their budgets on ICT infrastructure. For example, in the current study, the involved University, the QwaQwa campus of the UFS, the academic staff was provided with computers (with 24-hour internet connection), as well as technology support through the department of e-learning to assist in ICT integration in the classroom. Despite this institutional effort to provide ICT tools, ICT use in classroom instruction still remains low. Research has shown that merely making available ICT technology and equipment does not imply the successful use and implementation of ICT in the classroom (Abrahams, 2010:35; Buabeng-Andoh, 2012:136; Ntemana and Olatokun, 2012:182).

There are various factors influencing ICT integration in the classroom. These factors include, among others, unreliable access to electricity, limited technology infrastructure (especially internet access, bandwidth, hardware and software provision), and teachers’ knowledge, skills and attitudes towards ICT use. Among these factors, teacher-related variables, such as teachers’ attitudes towards ICT, have been found to be the most powerful predictors of technology integration. Consequently, the following research question emerged: *Do attitudes towards* *computer usage predict the integration of information and communication technology in the higher education sector?*

To answer this question, a comprehensive literature study was conducted to determine the factors already researched that may have an influence on ICT integration in the classroom. Various theoretical models including Rogers's theory on Diffusion of Innovations (1995) and Ajzen and Fishbein's theory of Reasoned Action (1980) were also used to better understand the key factors affecting ICT integration into the classroom, as well as the academic staff's attitudes towards ICT integration in the classroom.

In Chapters 2 and 3, a literature study has been discussed that was conducted to determine factors that affect ICT integration in the classroom. These factors were attended to in 2.5 and 3.1. Attitudes towards computer use were the most important factor proven to be a predictor of ICT integration in the classroom by international researchers. Other factors such as computer anxiety, computer attributes, cultural perception and computer competence, as well as personal characteristics, which are thought to influence attitudes, were also determined. Therefore, computer attitudes, computer anxiety, computer attributes, cultural perception and computer competence were identified as independent variables.

Chapter 4 focused on the research methodology. Data were collected from the academic staff on the QwaQwa campus of the UFS during 2012. The data were gathered by means of existing or adapted questionnaires that the academic staff had to complete. The questionnaires that served as measuring instruments included: a biographical questionnaire, the computer anxiety questionnaire, attitude towards computer technology questionnaire, computer attributes questionnaire, cultural perception questionnaire, computer competence questionnaire and the ICT integration questionnaire.

The data gathered from the respondents were coded by the department and then captured by the Department of Information and Technology Services at the UFS. These were then analysed using SAS. To test the hypotheses, univariate and full-model regression analysis were conducted using a 0.05 level of significance.

Chapter 5 focused on the results of the study and the discussion of the results. In this chapter, a summary of the findings as well as the limitations of the study will be presented. The chapter concludes with making recommendations from the findings on how to improve ICT integration in the classroom and drawing a conclusion.

## 6.2 SUMMARY OF THE FINDINGS

To interpret the results of the study, descriptive statistics and inferential statistics were used. The descriptive and inferential statistics were used to describe and summarize the data collected from the respondents. The descriptive analyses included frequency distribution, mean, percentage standard deviation and median. Inferential statistics was used to test the hypotheses. The following paragraphs will present the conclusions regarding the confounding variables, independent variables and dependent variable.

### 6.2.1 Confounding variables

6.2.1.1 Gender

As indicated in Chapter 5 (5.2.1.2), 84 respondents indicated their gender on the biographical questionnaires. More males participated in the study since 27% of the respondents were female, while 73% were male. Inferential statistics shows that according to the analysis on a $P<0.05$ level of significance, there is no significant relationship between gender and ICT integration. This finding challenges the long perceived male bias in the computer environment and instead supports recent studies that have identified greater gender equivalence in interest, opportunity, use and skills level (see Chapter 3 [3.4.5.1]).

#### 6.2.1.2 Ethnicity

Descriptive statistics indicates that 70% of the respondents were black, 24% were white, 1% were coloured and 5% were Indian/Asian. This indicates that the majority of the respondents who participated in the study were black, followed by white, coloured and Indian/Asian. The analysis of association revealed that there is no relationship between ethnicity and ICT integration on a $p<0.05$ level of significance. Thus, it can be said that ethnicity is fast becoming an element not to consider when studying technology usage. This could be due to the fact that technology is now part of almost every aspect of human life irrespective of ethnic background.

#### 6.2.1.3 Age

According to the descriptive statistics, the age of the respondents who participated in the study varies between 21 and 68 years. The mean age was 42 years. The analysis of association revealed that there is no relationship between age (young and old) and ICT integration on a $P<0.05$ level of significance. This finding is in line with previous studies, which found no age (young and old) differences in ICT integration (see 3.4.5.2).This result can be an indicator that all academic staff are aware of the importance of ICT usage in teaching and learning environments.

#### 6.2.1.4 Academic rank

As reported in 5.2.1.4, 84 academic staff members indicated their academic rank on the biographical questionnaires. The majority of the respondents who participated in the study were at lecturer rank, since 15% of the respondents were senior lecturers, 25% were junior lecturers, 8% were assistants, 1% was a principal, 7% were heads of department and 43% were lecturers. Inferential statistics shows that according to the analysis on a $p<0.05$ level of significance, there is no significant relationship between academic rank and ICT integration. This outcome suggests that academic staff members at all stages of their academic rank were equally able to integrate ICT into their classroom.

#### 6.2.1.5 Educational level

Descriptive statistics indicates that 45% of the respondents had master's degrees, 28% had a PhD, 23% had an honours degree and 5% had a first degree. This indicates that the majority of the academic staff members held master's degrees, followed by PhDs. The analysis of association revealed that there is no relationship between educational level and ICT integration on a $P<0.05$ level of significance. This result does not agree with Rogers's (1995:35) supposition that an individual's educational level affects his/her adoption of an innovation. It may be that technology has been a part of education for a long enough period of time that the educational level of a staff member is no longer influential on computer integration. However, the study does support a finding reported by Qudais et al. (2010:139).

#### 6.2.1.6 Teaching experience

According to the descriptive statistics, the teaching experience of the respondents who participated in the study varies between 0 and 42 years. The mean teaching experience was 11 years. The analysis of association revealed that there is no relationship between teaching experience and ICT integration on a $P<0.05$ level of significance. This result does not support Sadik's study (2006:108), which indicates that teachers who have longer teaching experience are more likely to appreciate the importance of computer use in the classroom. However, this can be attributed to the institution-wide initiative to provide in-service computer-training programmes as well as the required computer hardware and software to all academic staff members regardless of their teaching experience.

6.2.1.7 Computer training

Descriptive statistics indicates that 45% of the respondents had self-taught training, 31% did short course training, 18% had formal training, and 6% had no computer training. The analysis of association revealed that there is no relationship between computer training and ICT integration on a $P<0.05$ level of significance. This result disagrees with the vast numbers of researchers who found computer training as a predictor of ICT use in the classroom (OTA ,1995:130; Whitaker and Coste, 2002:53; Toprakci, 2006:6).This is understandable, given that most of the respondents had at least some form of computer training (either self-taught or formal training) which suggests ICT use in the classroom.

### 6.2.2 Independent variables

6.2.2.1 Computer anxiety

As indicated in 5.2.3.1, the mean of the computer anxiety was 93 and the median was 94. The mid-point of this equal interval scale was 57. The median of 94 is higher than the mid-point of 57 which could have indicated that the sample had a high level of computer anxiety. However, the full-model regression analysis indicates computer anxiety not to be a predicting factor of ICT integration in the classrooms. Previous research has linked computer anxiety to lack of technology exposure and familiarity (Tekinarslan, 2008:1581). With familiarity, computer anxieties and fears tend to decrease, and confidence increases. The researcher concludes that the on-going institutional support in ICT implementation in the classroom may have increased academic staff's confidence in dealing with the computers (see 1.3).

6.2.2.2 Computer attitude

As indicated in 5.2.3.2, the mean value score for academic staff attitudes towards computer was 100.75, and the median was 105.50. The mid-point of this equal interval scale was 60. The median of 105.50 is higher than the mid-point of 60 which could have indicated that the sample had a high score in their attitude towards ICT. However, the full-model regression analyses indicate no relationship between computer attitudes and ICT integration. The fact that the academic staff members had obtained high scores regarding their attitude towards computer suggests that merely having a positive attitude towards ICT integration does not guarantee the integration of ICT in classroom instruction. Previous research suggested that the more experience teachers have with computers, the more likely the chances that they will show positive attitudes towards computers (Rozelland Gardner, 1999 cited in Buabeng-Andoh, 2012:138). The researcher could assume that, as ICT implementation was still at initial stages, academic staff still needs more time to familiarize themselves with computer usage to gain more experience.

#### 6.2.2.3 Computer attributes

The descriptive statistics regarding the perceptions of computer attributes revealed that the mean value score for computer attributes was 88.06 and the median was 90.00. The mid-point of this equal interval scale was 54. The median of 90.00 is higher than the mid-point of 54, which could have indicated that the sample had rated computer attributes highly. Surprisingly, the results of the full-model regression analyses are not consistent with the results from the ANCOVA. The result from full-model regression analysis indicates a significant relationship between computer attributes and ICT integration, while the result from ANCOVA indicates no relationship between computer attributes and ICT integration. The differences in the analysis could be attributed due to the interrelationship of variables (refer to paragraph 5.4.2).

#### 6.2.2.4 Cultural perception

The descriptive statistics analysis revealed that the mean score on the cultural perceptions was 19.40 and the median was 20.00. The mid-point of this equal interval scale is 54. The median of 20.00 is lower than the mid-point of 45, which could have indicated that the sample had given cultural perception a low rating.

Interestingly, the results of the univariate and a full-model regression analyses are not consistent. The full-model regression analysis indicates a significant relationship between cultural perceptions and ICT integration while the ANCOVA shows no relationship between cultural perceptions and ICT integration. The results of this study partially represent a confirmation of Rogers's (1995) finding on the importance of culture and social norms in technology adoption. This suggests the need for further research on the relationship between cultural perception and ICT integration in the classroom.

6.2.2.5 Computer competence

The descriptive statistics analysis revealed that the mean score on computer competence was 60.41 and the median was 62.00. The mid-point of this equal interval scale is 42. The median of 62.00 is lower than the mid-point of 42, which could have indicated that the sample had indicated a high computer competence. The results of full-model regression analyses and ANCOVA indicate a significant relationship between computer competence and ICT integration. The study suggests the institution's need of further efforts (in terms of offering professional development and technical support) to ensure that the academic staff become more competent in using ICT in a classroom setting. Moreover, the current university-based courses need to be redesigned and reorganized to improve academic staff's efficiency regarding computer applications for instructional purposes.

### 6.2.3 Dependent variables

As indicated in Chapter 5 (5.2.4.1), the mean score of the dependent variable, ICT integration, was 45.02 and the median score was 45.50. The mid-point of this equal interval scale is 30. This suggests that the sample had indicated a high level of ICT integration, since the median of 45.50 is higher than the mid-point of 30. According to the univariate analyses, the confounding variables (age, gender, ethnicity, academic rank, educational level, teaching experience in years, time on computer training, years of ICT use in class and type of computer training over the past five years) are not statistically related to ICT integration on a $P < 0.05$ level of significance. Regarding the independent variables, only computer competence is statistically related to ICT integration. Computer anxiety, computer attitude, computer attributes and cultural perceptions are not statistically related to ICT integration on a $P < 0.05$ level of significance.

From the sample responses, it is clear that the respondents had obtained a moderate skewedness ICT integration score, meaning they have partially accepted the rationale for introducing ICT into classroom teaching. Thus, on average the respondents considered ICT as a viable educational tool that has the potential to bring about different improvements in their classrooms.

## 6.3 LIMITATIONS OF THE STUDY

Even though this study indicated valuable and interesting findings, the following limitations have to be taken into account:

- The sample size used in the study was adequate. However, because convenience sampling was used instead of random sampling, the result cannot be generalized to a wider population (only limited to the selected group of academic staff) (Kerlinger, 1986:300).

- ICT adoption may be affected by many others factors, not attended to in the study, which include personal, institutional, or technological aspects. The present study focused only on a few selected factors related to Rogers's theory (computer attitude, computer attributes, and cultural perceptions), computer anxiety, computer competence and some demographic variables. Other important factors influencing academic staff ICT adoption may still exist and have not been investigated by this study.

- This study was conducted in a developing country and at a university campus in a rural setting, where the situation is different from universities in more advanced countries, as well as urban universities, in which the use of computers may be far more commonplace.

- The data in this study were obtained by means of survey instruments (quantitative nature of the survey), hence participates were not provided the opportunity to explain or perhaps give reasons for their responses. In future studies, the researcher might wish to collect in-depth information through interviews and /or observations to explore why academic staff accept or reject ICT integration for classroom instruction.

## 6.4 RECOMMENDATIONS

Based on the data analysis and findings of the study, the researcher wishes to make the following recommendations.

- **ICT competencies for academic staff**: Academic staff need to be given sufficient training on how to use ICT with the teaching and learning process to acquire the requisite knowledge and skills in integrating the technology into classrooms. The training should not be a once-off training but a continuous process. Training should not be limited to how to use computer technology but should also show academic staff how they can make use of computer technology in improving the quality and effectiveness of their instruction, as well as how such technology resources can be effectively integrated into teaching and learning. The training provided should be well structured and must assist academic staff to not only develop ICT skills but also to be able to fully integrate ICT into classroom instructions.

- **Encourage and support collaboration between academic staff:** Greater use of the online facilities should be taken into consideration and the needs of academic staff to engage effectively in on-line discussion. Tools such as websites, discussion groups, e-mail communities, radio or television broadcasts provide great opportunities for academic staff to discuss and share ideas, and experience of new technology.

- **Execute a collective approach to promote ICT use in the classroom instructions:** A collective approach is needed both from students and academic staff in promoting ICT use in the classroom. LMS (blackboard) and social media such as Facebook and Twitter should be used more often as a means of communication between the lecturer and the students.

- **Create awareness of existing ICT facilities and services at the institution:** It is important for all academic staff in the institution to know the existence of ICT facilities and services and their importance in relation to their teaching tasks.

- **Administrative support:** Administrative support is critical to the successful integration of ICT into teaching and learning processes. Administrators can provide the conditions that are needed, such as ICT policies, incentives and resources. The number of computer laboratories should be increased, and the use of computers and peripheral devices, such as projectors, should be provided and encouraged within the classroom.

- **Technical support:** To sustain the continued viability of ICT use in classroom instructions, it is important that the academic staff receive full time technical support.

## 6.5 FURTHER RESEARCH

Future studies can build on the results of this study to enrich the existing knowledge in the area being investigated - determining whether attitudes towards computer usage predict ICT integration in the classroom. Based on the analysis of the data and the ensuing findings, the following recommendations (for future research) are presented:

- This study could be repeated by selecting a random sample from other rural South Africa universities so that it can be generalized to academic staff from all rural universities in South Africa.

- The study did not examine the relationships amongst the independent variables. The future study needs to consider these relationships. These variables include computer anxiety, computer attitudes, computer attributes, cultural perceptions and computer competence.

- A future study should rather adopt a mixed-mode approach, that is, a combination of quantitative and qualitative methods of data collection. A qualitative method would have provided an opportunity to gain insight into the reasons for the findings, and might have provided plausible explanations for the quantitative data.

- Since the current study is the first of its kind conducted on a rural South Africa university campus, similar studies are required to produce more knowledge in this area. Such studies may consider changing the setting, population, sampling procedures, or data collection methods used in the current study. For example, future researchers may examine the attitudes of academic staff in other South African rural universities.

## 6.6 CONCLUSION

The answer to the research question and subsidiary questions that were presented in Chapter 1 (1.4) are as follows:

- Attitudes towards computer usage do not predict the integration of ICT in the higher education sector.
- Computer anxiety does not predict ICT integration in the classroom.
- Computer attributes moderately predict ICT integration in the classroom.
- Cultural perceptions moderately predict ICT integration in the classroom.
- Computer competence predicts ICT integration in the classroom.

This research project did not find computer attitudes and computer anxiety as a predictor of ICT integration in the classroom, but did find computer attributes, and cultural perception partially predicting ICT integration in the classroom. Computer competence is seen as the most influencing factor in ICT integration in the classroom. Since computer competence, cultural perceptions and computer attributes are critical components for ICT integration in the classroom, effective institutional support (in terms of providing opportunities to academic staff to master adequate skills and knowledge) is required to ease ICT integration into the classroom. Academic staff should be encouraged to use computers in their classroom instruction more often. The frequent use of computers in the classroom will lead to better computer skills, and consequently to ICT integration in the classroom. Given the recent presence of technology at QwaQwa campus of the University of Free State, the institution should not only focus on providing computers for the academic staff, but also fosters a culture of acceptance of these tools amongst the academic staff. Academic staff needs to be assured that technology can make their teaching interesting, easier, more fun for them and the students, more motivating and more enjoyable. In this study, Rogers's theory on diffusion of innovation was helpful in categorizing and understanding the relationship between academic staff and instruction technologies as well as suggesting directions for research in these technologies.

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# APPENDIX

## Appendix A: Permission to conduct research at institution

UNIVERSITEIT VAN DIE VRYSTAAT
UNIVERSITY OF THE FREE STATE
YUNIVESITHI YA FREISTATA

UFS
UV

To:
Ms. RD Wario
Department of Computer Science & Informatics
UFS Qwaqwa

***RE: Request for permission to conduct research***

In my capacity as the Academic Head at the University of the Free State Qwaqwa campus, I hereby grant you the permission to conduct research on the issues related to study which include the The influence of Academic Staff Attitudes on Information and Communication Technology (ICT) Integration in Rural South Africa Higher Education.

Since the project intends to advance our teaching and learning practices through the use of ICT, I hereby offer my full support for the questionnaire survey.

Regards

Prof. W. F. van Zyl
Assistant to the Campus Principal: Academic Head
University of the Free State
Qwaqwa Campus
P. Bag X13
PHUTHADITJHABA
9866

Tel. No. (058) 718 5111
Fax. No. (058) 718 5445

## Appendix B: Sample letter to participants

UNIVERSITEIT VAN DIE VRYSTAAT
UNIVERSITY OF THE FREE STATE
YUNIVESITHI YA FREISTATA

UFS
UV

***RE: Request for your participation in Questionnaire survey***

I kindly request your presence and participation in a questionnaire survey which will investigate the level of ICT integration into classroom. Factors such as computer attitudes, computer anxiety, computer competence, computer attributes and cultural perception that are thought to be influencing will also be investigated. The survey will be lead by the researcher (RD Wario) and contributes to her PhD Research project. The study is significant because classroom based ICT integration and academic staff attitudes towards computer at UFS; QwaQwa campus has not previously been investigated hence this research will be an important step that might ease ICT implementation in the classrooms.

The questionnaire will focus on your levels of computer attitudes, computer anxiety, computer competence, computer attributes, cultural perception and ICT integration into classroom.

Your participation will be greatly appreciated and it is paramount to the success of ICT integration in our campus. The time needed to fill questionnaire will be approximately 20 minutes. The questionnaire will be delivered to you in person by the researcher (RD Wario) to your offices.

All participants are assured confidentiality and anonymity where necessary.
Permission to conduct this investigation has been approved by the QwaQwa campus Management of University of the Free State.

Kind Regards

Ms. RD Wario
Lecturer
Department of Computer Science & Informatics
UFS Qwaqwa Campus,
Office: Library Building B2017
For confirmation: - RSVP to: wariord@qwa.ufs.ac.za
(Schedule time will be arranged in consultation with participants)

## Appendix C: Research questionnaire

**ATTITUDES TOWARD COMPUTER TECHNOLOGY**

**General Instructions: The purpose of this questionnaire is to examine your attitudes toward the introduction of information technology into a rural South African University. The questionnaire consists of seven sections. Each section begins with some directions pertaining to that part only. As you begin each section, please read the directions carefully and provide your responses candidly in the format requested.**

| | | | | Office Use | |
|---|---|---|---|---|---|
| | Cadidate Number | | | | |
| SECTION 1: BIOGRAPHICAL INFORMATION | | | | | |
| | Direction: Please tick the appropriate response in the space provided with an (X) | | | | |
| 1 | What is your gender? | 1. Male | | | |
| | | 2. Female | | | |
| 2 | What is your age? | | | | |
| 3 | What is your Ethnicity? | 1. Black | | | |
| | | 2. White | | | |
| | | 3.Coloured | | | |
| | | 4. Indian /Asian | | | |
| | | 5. Other (specify) | | | |
| 4 | What is your current academic rank? | 1. Principal | | | |
| | | 2. HOD | | | |
| | | 3. Senior Lecturer | | | |
| | | 4. Lecturer | | | |
| | | 5.Junior Lecturer | | | |
| | | 6. Assitant | | | |
| 5 | Including the current year, how many years have you been teaching? | | | | |
| 6 | What is your highest level of academic qualification? | 1. Diploma | | | |
| | | 2. Degree | | | |
| | | 3. Honours Degree | | | |
| | | 4. Masters Degree | | | |
| | | 5. PhD | | | |
| 7 | What type of computer training have you had over the last 5 years? | 1. None | | | |
| | | 2. Self Taught | | | |
| | | 3. Short Course | | | |
| | | 4. Formal Training | | | |
| 8 | What is the total amount of time that you have spent on computer training courses in days? | | | | |
| 9 | How many years have you used computers in the classroom as part of instructions? | | | | |

## SECTION 2: COMPUTER ANXIETY RATING SCALE AMONG QWAQWA CAMPUS STAFF

INSTRUCTION: The questions are on your feelings about computers. Please read each statement below and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = Strongly Disagree; 2 = Moderately Disagree; 3 = Disagree ; 4 = Agree; 5 = Moderately Agree; 6 = Strongly Agree

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | I feel insecure about my ability to interpret a computer printout | | | | | | | | |
| 2 | I look forward to use a computer | | | | | | | | |
| 3 | I do not think I would be able to learn a computer programming language | | | | | | | | |
| 4 | The challenge of learning about computers is exciting | | | | | | | | |
| 5 | I am confident that I can learn computer skills | | | | | | | | |
| 6 | Anyone can learn to use a computer if they are patient and motivated | | | | | | | | |
| 7 | learning to operate computers is like learning any new skills- the more you practice, the better you become | | | | | | | | |
| 8 | I am afraid that if I begin to use computers, I will become dependent upon them and lose some of my reasoning skills | | | | | | | | |
| 9 | I am sure that with time and practice, I will become more confortable working with computers | | | | | | | | |
| 10 | I feel that I will be able to keep up with the advances happening in the computer field | | | | | | | | |
| 11 | I dislike working with machines that are smarter than I am | | | | | | | | |
| 12 | I feel apprehensive about using computers | | | | | | | | |
| 13 | I have difficulty in understanding the technical aspects of computers | | | | | | | | |
| 14 | It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key | | | | | | | | |
| 15 | I hesitate to use a computer for fear of making mistakes that I cannot correct | | | | | | | | |
| 16 | You must be a genius to understand all the special keys contained on most computer keyboards | | | | | | | | |
| 17 | If given the opportunity, I would like to learn about and use computers | | | | | | | | |
| 18 | I have avoided computers because they are unfamiliar and somewhat intimidating to me | | | | | | | | |
| 19 | I feel computers are necessary tools in both educational and work settings | | | | | | | | |

## SECTION 3: ATTITUDES TOWARD COMPUTER TECHNOLOGY

INSTRUCTION: The questions are on your attitudes to computers. Please read each statement below and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = Strongly Disagree; 2 = Moderately Disagree; 3 = Disagree ; 4 = Agree; 5 = Moderately Agree; 6 = Strongly Agree

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Computers do not scare me at all | | | | | | | | |
| 2 | Computers make me feel uncomfortable | | | | | | | | |
| 3 | I am glad there are more computers these days | | | | | | | | |
| 4 | I do not like talking with others about computers | | | | | | | | |
| 5 | Using computers is enjoyable | | | | | | | | |
| 6 | I dislike using computers in teaching | | | | | | | | |
| 7 | Computers save time and effort | | | | | | | | |
| 8 | Schools would be a better place without computers | | | | | | | | |
| 9 | Students must use computers in all subject matters | | | | | | | | |
| 10 | Learning about computers is a waste of time | | | | | | | | |
| 11 | Computers would motivate students to do more study | | | | | | | | |
| 12 | Computers are a fast and efficient means of getting information | | | | | | | | |
| 13 | I do not think I would ever need a computer in my classroom | | | | | | | | |
| 14 | Computers can enhance students' learning | | | | | | | | |
| 15 | Computers do more harm than good | | | | | | | | |
| 16 | I would rather do things by hand than with a computer | | | | | | | | |
| 17 | If I had the money, I would buy a computer | | | | | | | | |
| 18 | I would avoid computers as much as possible | | | | | | | | |
| 19 | I would like to learn more about computers | | | | | | | | |
| 20 | I have no intention to use computers in the near future | | | | | | | | |

## SECTION 4: COMPUTER ATTRIBUTES

INSTRUCTION: The questions are on attitude towards computer attributes. Please read each statement below and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = Strongly Disagree; 2 = Moderately Disagree; 3 = Disagree ; 4 = Agree; 5 = Moderately Agree; 6 = Strongly Agree

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Computers will improve education. | | | | | | | | |
| 2 | Teaching with computers offers real advantages over traditional methods of instruction. | | | | | | | | |
| 3 | Computer technology cannot improve the quality of students' learning | | | | | | | | |
| 4 | Using computer technology in the classroom would make the subject matter more interesting. | | | | | | | | |
| 5 | Computers are not useful for language learning. | | | | | | | | |
| 6 | Computers have no place in schools. | | | | | | | | |
| 7 | Computer use fits well into my curriculum goals. | | | | | | | | |
| 8 | Class time is too limited for computer use. | | | | | | | | |
| 9 | Computer use suits my students' learning preferences and their level of computer knowledge. | | | | | | | | |
| 10 | Computer use is appropriate for many language learning activities. | | | | | | | | |
| 11 | It would be hard for me to learn to use the computer in teaching. | | | | | | | | |
| 12 | I have no difficulty in understanding the basic functions of computers. | | | | | | | | |
| 13 | Computers complicate my task in the classroom. | | | | | | | | |
| 14 | Everyone can easily learn to operate a computer. | | | | | | | | |
| 15 | I have never seen computers at work. | | | | | | | | |
| 16 | Computers have proved to be effective learning tools worldwide. | | | | | | | | |
| 17 | I have never seen computers being used as an educational tool. | | | | | | | | |
| 18 | I have seen some academic staffs use computers for educational purposes | | | | | | | | |

## SECTION 5: CULTURE PERCEPTION

INSTRUCTION: The questions are on culture perception. Please read each statement below and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = Strongly Disagree; 2 = Moderately Disagree; 3 = Disagree ; 4 = Agree; 5 = Moderately Agree; 6 = Strongly Agree

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Computers will not make any difference in our classrooms, schools, or lives. | | | | | | | | |
| 2 | Students need to know how to use computers for their future jobs. | | | | | | | | |
| 3 | Students prefer learning from teachers to learning from computers. | | | | | | | | |
| 4 | Knowing about computers earns one the respect of others. | | | | | | | | |
| 5 | We need computers that suit better the African culture and identity. | | | | | | | | |
| 6 | Computers will improve our standard of living. | | | | | | | | |
| 7 | Computers are proliferating too fast. | | | | | | | | |
| 8 | People who are skilled in computers have privileges not available to others. | | | | | | | | |
| 9 | Computers will increase our dependence on foreign countries. | | | | | | | | |
| 10 | There are other social issues that need to be addressed before implementing computers in the classroom. | | | | | | | | |
| 11 | The increased proliferation of computers will make our lives easier. | | | | | | | | |
| 12 | Computers dehumanize society. | | | | | | | | |
| 13 | Working with computers does not diminish people's relationships with one another. | | | | | | | | |
| 14 | Computers encourage unethical practices. | | | | | | | | |
| 15 | Computers should be a priority in the classroom. | | | | | | | | |

## SECTION 6: COMPUTER COMPETENCE

INSTRUCTION: The questions are on your competence level in computer use (i.e., both your knowledge and skills). Please read each statement below and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = No Competence; 2 = Little Competence; 3 = Very Little Competence; 4 = Much Competence; 5 = Very Much Competence; 6 = extraordinary

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Install new software on a computer | | | | | | | | |
| 2 | Use a printer | | | | | | | | |
| 3 | Use a computer keyboard | | | | | | | | |
| 4 | Operate a word processing program(e.g.,Word) | | | | | | | | |
| 5 | Operate a presentation program(e.g.,PowerPoint) | | | | | | | | |
| 6 | Operate a spreadsheet program(e.g.,Excel) | | | | | | | | |
| 7 | Operate a database program(e.g.,Access) | | | | | | | | |
| 8 | Use the Internet for communication(e.g.,email & chatroom) | | | | | | | | |
| 9 | Use the World Wide Web to access different types of information | | | | | | | | |
| 10 | Solve simple problems in operating computers | | | | | | | | |
| 11 | Operate a graphics program | | | | | | | | |
| 12 | Use computers for grade keeping | | | | | | | | |
| 13 | Select and evaluate educational software | | | | | | | | |
| 14 | Create and organize computer files and folders | | | | | | | | |

## SECTION 7: ICT INTEGRATION

INSTRUCTION: The questions are on computer integration. Please identify how often you have integrated computer into your classroom teaching and respond to it by marking with an X. Each of the responses on the scale from (1) to (6), where: 1 = Never; 2 = Rarely ; 3 = Often; 4 = Very Often; 5 = Sometimes; 6 = Always

| | | 1 | 2 | 3 | 4 | 5 | 6 | Office Use | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | I have integrated ICT in my lessons during this academic year | | | | | | | | |
| 2 | I used word processing software to prepare my tests e.g. Microsoft Word | | | | | | | | |
| 3 | I used spreadsheet software to process students' test marks, e.g Microsoft Excel | | | | | | | | |
| 4 | I use presentation software to present my lessons, e.g. Microsoft PowerPoint | | | | | | | | |
| 5 | I use database software to analyse students' test marks, e.g. Microsoft Access | | | | | | | | |
| 6 | I use the Internet to collect information related to your subject area | | | | | | | | |
| 7 | I use e-mail facilities to communicate with fellow lecturers | | | | | | | | |
| 8 | I use e-mail facilities to communicate with students | | | | | | | | |
| 9 | I use the computer to facilitate drill and practice exercises for students | | | | | | | | |
| 10 | I use a computer at home | | | | | | | | |