

**Virtual mobility in tertiary education; the impact  
of ICT based communication on learning**

**HA IDOWU Hons BSc**

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# **Dedication**

This work is dedicated to my precious children,

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&

My golden wife (IDOWU-Hamed, Kabirat Adenike), whose unconditional love and support has given me the strength, determination and fortitude to accomplish any goal.

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This work would have been impossible without the assistance of my golden parents, who introduced me to formal education. Their encouragement assisted in advancing my career to this level. Appreciation is also due to my brothers and sisters for their all-time support. I cannot do without saying “thank you” to my dearest sister, Alhaja Anatallahi Aderonke Aregbesola – you mean so much to me.

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Finally, my greatest appreciation goes to my creator, “the Planner, the Fashioner, the Designer, Omnipotence, Omnipresence and Omniscience”; Almighty “**ALLAH**” who spared my life and made it possible for me to do this work, especially at a time, when in man’s thinking, “this would be impossible”. I say “*Alhamdu liLah Rabil Alamin*<sup>1</sup>” (All praise to **HIM**, the lord of the Universe)

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<sup>1</sup> This is an Islamic way of praising God.

# Executive Summary

## **Background and rationale for the research**

As the world becomes more of a global village, people are faced with different challenges. Some of these challenges include the globalisation of business and of the workforce. This has in effect resulted in increased workload for the people. However, in order to cope with these constantly changing challenges, there is the need for people to upgrade their knowledge on regular bases either by enrolling for further studies or by attending formal training. In some cases, this training has to be attended abroad - thus leaving the worker with the choice of leaving the work for the training or abandon the training for the work.

Information and Communication Technology (ICT) introduced the possibility to access information and services, and to communicate with people who are spatially remote. Telephones, videoconferences, and computers are technological tools that can be used to achieve this possibility. Consequently, the technology has the potential to substitute some of the travel that is presently associated with these activities. This substitution of travel through ICT based communication has been termed virtual mobility.

A traditional university provides a location for students and lecturers to meet but at the same time limits the mobility of both. Learning and studying has become more global. More and more people spend time abroad at universities all over the globe. With this increasing need of studying and working abroad, ever more mobility is required. This mobility creates another special challenge: the possibility to attend courses over long distances. This overall mobility is highly desirable as it offers people the possibility of gaining new insights.

Virtual mobility, can overcome this bottleneck, when applied to learning (especially in tertiary education), but places a burden on lecturers and institution owners to provide material and infrastructure for remote students. This dissertation focuses on studying the

possibility of converting traditional classrooms into virtual classrooms, as well as putting virtual mobility in a strong didactical context.

## **Research Questions**

The following questions are the subjects of this research work;

1. Can a virtual classroom replace the traditional classroom?
2. How can we convert a traditional classroom into a virtual classroom?
3. What are the technological barriers involved in the implementation?
4. What are the future developments in the virtual learning environment?

In trying to answer these questions, a number of tertiary institutions' instructors and support staff were interviewed. Tertiary institutions' students were approached with questionnaires to seek their opinions. In addition, some ICT technocrats were also interviewed. A total of 60 lecturers and support staff were targeted with 47 of them returning the questionnaires. Similarly, about 200 questionnaires were distributed to the students with 152 returned. Also, 25 ICT experts, technocrats and academicians were interviewed. The questionnaire distribution and the interviews were conducted in both South Africa and Nigeria as these two countries are the target countries for the implementation of the test prototype.

## **Research question, finding and conclusion**

The investigation produced satisfactory results. These results will now be discussed with the corresponding conclusion derived from the investigation.

1. **Can a virtual classroom replace the traditional classroom?** There have been several efforts aimed at breaking the barrier created by distance within the academic community. Such emerging effort includes distance and online education etc. These are testimonies to the fact that there is the need for virtual teaching and learning. The acts of teaching and learning often take place in the classroom. Therefore, if virtual teaching and learning is possible then, a traditional classroom can be replaced by a virtual classroom.

2. **How can we convert the traditional classroom to virtual classroom?** This transformation will be an imitation of the traditional way of learning but in electronic form. The face-to-face interaction between the students and the lecturer will be replaced by interaction via online meeting, video conference or audio conference. The chalkboard will be replaced with a data projector and the lecturer chalk will be a slide presentation or presentation via media player. CD/DVD ROM will replace the class note and textbooks while an online library will substitute for the physical library. In addition, a simulation process will replace practical classes for the science students.
  
3. **What are the technological barriers involved in the implementation?** Creation of software systems for supporting virtual education is still problematic. The same functionality must be available for all popular user platforms .Aside from these, bandwidth limitation of the present internet is still a problem.

The fact that there is no standard yet for software written for ICT applications in learning is a problem. Various vendors' equipment is not interoperable and this poses problems between remote users and an institution's equipment. This, in effect, will force both the institution and users to use interoperable equipment.

4. **What are the future developments in the virtual learning environment?** As technology keeps improving, there will be new development in the nature of equipment, software and protocols. These emerging technologies cannot be overlooked in the design of a virtual environment. An obsolete equipment or infrastructure will cause a set back for the objective for which it was setup. Hence, I propose that institution owners look out for the following emerging technological tools during their implementation of virtual technology:

**IP Version 6 (IPv6)** - This the next level of Internet protocol with 128 bit addressing which will replace the 32 bit addressing currently in use. This will

accommodate billions of end users and equipment, unlike the IPv4 (the current Protocol) which will soon be exhausted.

**The New Network** – The new network comprises of US 'Internet2' and the European's 'Geant'. These are multi-gigabyte Inter-network, which provides for 1000Gigabyte of data movement over the internet. These possibilities will enhance the use of audio and video equipment over the internet.

**Wireless and PDAs** – Wireless LAN provides seamless mobility and roaming for users, thus beating the barrier caused by traditional wired LAN. With the power of wireless connectivity, laptop and PDA users will have the freedom to choose where to be during learning.

**Haptic interface** - Haptic is the science of applying tactile sensation to human interaction with computers. A haptic device is one that involves physical contact between the computer and the user, usually through an input/output device, such as a joystick or data-gloves, which senses the body's movements. By using Haptic devices, the user can feed information to the computer and at the same time, receive information from the computer in the form of a felt sensation on some part of the body.

A complete chapter (Chapter 5) was used to demonstrate a prototype virtual classroom. A virtual classroom was designed with particular reference to the Centre for Research and Continued Engineering Development (CRCED Vaal) of the Faculty of Engineering, Northwest University, South Africa.

The design adopted the use of integrated local area network (LAN), wireless local area network (WLAN) and virtual private network (VPN) as the access media for the virtual classroom. The students and the instructor situated in a dedicated virtual classroom will access the classroom LAN via Ethernet switch, those not in the class but within the university's wireless coverage area, can access the classroom via the WLAN access

points (AP) and those outside the wireless coverage area (e.g. those living outside the University) will access the classroom by means of VPN via the Internet.

A collaboration tool was used for the implementation of this design, since it is an application that has the facilities for audio and video communications. It also has facility for chatting, exchanging files, documents and the ability to jointly work on an application. Of most importance to this work is the whiteboard, which could be used to do a slide presentation by the instructor during teaching. Students who are remote to each other can also use the whiteboard for tutorials and group discussions. Out of many applications with these features, Microsoft's Netmeeting was used for the implementation of this design.

## **Conclusion**

Virtual mobility can be applied to learning because a large number of people are willing to enrol for further studies. These people could not attend a traditional classroom, due to job and/or family responsibilities. The investigation also revealed that a large number of people are enthusiastic in using technology for their day-to-day activities but called for support services, which will make their experiences more worthwhile.

In a similar manner to demand and supply, increase in demand causes a corresponding increase in supply and vice versa. Hence, the more the number of virtual school we have, the more the number of enrolment that will be expected because technology has really transformed the behavior of the people.

Finally, because of the fact that human natural environment for socialisation is the physical (or geographical) space, our psych has been accustomed to this environment and we believe so much in it. Virtual space (or cyberspace) which brought another environment for socialisation has really proved to be very successful but the lack of physical face-to-face contact still makes it impossible for people to fully embrace it.

Hence, virtual learning may not totally replace traditional learning but can supplement or complement it. Secondly, we can only replace the traditional classroom with a virtual

classroom for some selected courses. Thirdly, the technological barriers can be overcome by training and making support services available for the end users. Fourthly, any mobility project should take into consideration future developments in their VM implementation to prevent their project from being obsolete before its completion.

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# CHAPTER

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## ONE

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### **1.0 Introduction**

Globalisation has come to stay and the world has become a global village. Such statements are commonplace. Along with these developments comes a completely new nomenclature. Terms such as “virtual mobility, virtual reality and virtual learning” are often used. This dissertation will give context and definition of these terms (see section 1.2)

This dissertation will introduce a set of terms which begin with the word ‘virtual’. First of all, Information and Communication Technology mediated communication is referred to as *virtual communication*. If this communication facilitates a substitution of physical travel, it is termed *virtual mobility*. Furthermore, when virtual communication is used to facilitate learning process, the term *virtual learning* is used.

### **1.1 Background**

The potential of virtual communication as a substitute for travel was recognized early. Not long after Alexander Graham Bell invented the telephone in 1876, a letter to the editor of *The Times* published May 10, 1879, pointed out that the obvious benefit of Mr. Bell's invention was that it could ‘replace the rapid journeying which wearied the businessman of today’, Albertson (as quoted by Anfalk, 2002:5).

Since then, technology has evolved and innovations have continually emerged. What we today term Information and Communication Technology, provides us with an array of possibilities to communicate with others who are spatially remote. Modern telecommunication technology has made it possible to meet through audioconferencing or videoconferencing or both (teleconference). Via computers and the Internet, we can collaborate by sending text, picture and voice messages, and work jointly on the same documents.

This expansion and strengthening of the virtual communications toolbox has been accompanied and driven by the growing demand for more numerous and remote contacts in the globalised economy. Today, virtual meetings have become reality and an increasingly normal part of business communication.

Educational institutes often operate in an isolated environment, with little or no exchange of students or instructors. As a result, educational institutions often conceptualise, develop, and re-invented the same courses many times over. Furthermore, the mobility of both students and instructors is hindered, because the participation in courses offered by other institutions is complicated by regulations regarding the accreditation of achievements, e.g., credit points or exams. From a student's point of view, mobility (in several meanings of the term), is highly desirable to allow people to gain new insights and strengthen their flexibility.

Universities are faced with the challenge to restructure and modularise study programs as a result of increasing demand for long distance learning. In the case that physical mobility is not feasible due to time and cost issues, virtual mobility can be increased significantly. Virtual mobility in education is closely connected to the concept of e-learning: Computer-based technologies foster communication and collaboration between physically distributed persons. However, e-learning is not the solution to all pedagogical problems.

Introducing and using an e-learning system can be a complex and costly task. I propose an approach that will encourage students to become active in the learning process; instead of students and lecturers being grouped around a course, both are encouraged to actively look for materials, build groups, exchange information and knowledge, and look beyond the classroom walls.

We are progressing in the development of the communications and information technology. This is changing the landscape and cannot be ignored. This is not to say that changes need to occur because the technology is there. People are now aware that they are no longer excluded from studying, either for pleasure or furthering their career because they are working or raising family - this is a valuable achievement.

Virtual universities will help a new community of students to benefit from fruitful and fulfilling communication and learning without the need for mobility. There are also perceived benefits to existing higher education establishments. Depleting resources can be channeled into the most popular courses, with the more specialised subjects, which have limited demand, being taught virtually. Finally, the links that are being made with others across the globe is exciting and extremely positive for everyone involved in education at any level.

## ***1.2 Nomenclatures and Definitions***

There are few technical terms used in this dissertation that need to be defined or explained. These terms are listed below:

***Application*** is used here to describe the use of one or more information and communication technologies for a specific purpose or in a particular situation. For example using a computer to send an e-mail or making a telephone call using a conference telephone. In this dissertation, 'application' is primarily used to describe virtual meetings, telework and virtual Learning. (Anfalk, 2002:13)

***Information and Communication Technology (ICT)*** is a term used to describe all electronic information handling. ICT can be viewed as interchangeable with *Information Technology (IT)*, but the additional 'C' emphasis's the communication part of the industry, e.g. telecommunications. This includes hardware such as computers, telephones, fax, televisions, mobile phones, PDA, cables etc. the software to run them, the networks that link them and the whole theory surrounding this field. (The State of Queensland (Department of the Premier and Cabinet, 2006:37)).

***Teleconferencing*** is a common term for both *audio conferencing* and *videoconferencing*. These applications of telecommunication are used for communicating between two or more geographically separate locations. Audio conferencing transmits sound only, while videoconferencing transmits both sound and pictures (video). (Texas A & M University, 2006:9).

**Telemedicine:** Use of telecommunications technology for medical diagnosis and patient care when the provider and client are separated by distance. Telemedicine includes pathology, radiology, and patient consultation from the distance. (Texas A & M University, 2006:11).

**Telework:** occurs when ICT is applied to enable work to be done at a distance from the place where the work results are needed or where the work would have been done conventionally. (TDM Encyclopedia, 2003).

**Videoconferencing:** An interactive use of video, computing and communication technologies to allow people in two or more locations to meet; either one-on-one or in groups of up to a dozen people or so without being physically together. Video can be streamed over the Internet or broadcast over television monitors. (Microsoft, 2006).

**Virtual Communication:**<sup>2</sup> Synchronous and asynchronous communication mediated by ICT, making it possible for two or more geographically remote persons to interact. (Bengtsson, 1999).

**Virtual Learning:** Employing information and communication technologies to deliver instruction. Virtual learning is a term frequently used interchangeably with distance learning, online learning, e-learning, or web-based learning. (International Society for Technology in Education, 2005).

**Virtual Meetings:** Synchronous communication mediated by ICT, making it possible for two or more geographically remote people to interact. (TDM Encyclopedia, 2003).

**Virtual Mobility:** refers to the use of the new Information and Communications technologies (ICT) as an alternative to physical mobility. That is, it is about using ICT as the means of "getting to" activities that would previously have required transport or would have been impossible to do. (UK Department of Transport, 2002).

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<sup>2</sup> The term *Virtual Communication* has been selected, although it can be argued that for example telephony is 'formally recognised' as communication, not only 'being such in essence or effect' as the prefix *virtual* indicates. The term is selected for conformity of the terminology used in the dissertation, and the ease of understanding the meaning of the term.

**Web conferencing:** Videoconferencing without the video or, put another way, teleconferencing with the addition of the Web for interactive presentations, using PowerPoint, Excel or other documents. Audio can be transmitted by telephone and/or PC microphones. (Microsoft, 2006).

### ***1.3 Purpose and research question***

The purpose of this research is to contribute to the existing knowledge on how virtual mobility applications can be developed and applied in tertiary education. There is currently computer supported learning and cooperative learning at universities. There are also a few virtual universities.

This study links these three features in a way that reflects my vision of a future scenario, where an opportunity to learn (or have further qualifications) will be made available and accessible to people, such as adult learners and those who's social and financial incapability would have denied access to traditional university. This same vision makes it possible for the lecturers to be able to deliver lectures, chat with the students, set quizzes and examinations and provide feedback to the learners without physical appearance in the classroom.

I will further look into the possibility of moving from the physical classroom to a virtual classroom vis-à-vis the technological and technical problems associated with this transformation. In order to bring this vision to a reality, this dissertation attempts to answer four research questions. The presentation of each question is supported by a short rationale.

#### **1. Can Virtual learning replace traditional learning?**

This particular question is necessary for this research work: investigation into the possibility of replacing the traditional classroom with virtual learning environments. This question must be answered so that the feasibility of the project can be determined. The outcome of this question will give me an insight into the possibility of replacing the tradition classroom with a virtual classroom from a technological point of view.

#### **2. How can we transform a traditional classroom to a virtual classroom?**

This question stands to look into the techniques that will be used in the transformation of the traditional class room to a virtual classroom. The technological infrastructures that will be used, the method of teaching, communication means, etc. will be studied. Answers to these questions will be used to create a model for the setting up of the virtual classroom, virtual campus and probably the virtual University.

**3. What are the technological barriers involved in the implementation?**

If an institution intends to implement a virtual mobility application, what challenges does it face? A shift from face-to-face to virtual communication is a complex issue, associated with numerous consequences beyond technical issues. If an institution intends to promote virtual mobility in learning at the tertiary education level, this question is important.

**4. What are the future developments in the Virtual Learning environment?**

According to a popular adage, "*the only constant thing in life is change*". Therefore, in applying a technological driven concept, it is necessary to look at the trends in the technology and be able to forecast the future of the technology. A change will always come that will affect the equipment. The institution has to be up-to-date to face the challenges and threats posed by this change. This is necessary so that the equipment used will not become obsolete due to lack of awareness of technological change. This explains why question 4 is necessary.

### ***1.4 Scope and Limitation***

The scope of this research is limited to the use of virtual mobility in tertiary education. It also focuses on how to set up a virtual classroom with the aid of the technological means found feasible and affordable.

In addition, "telecommuting" has been examined in its context as a potential tool to reduce commuting, since most of the lecturers will have to adopt this means in accessing the campus network to obtain some vital college information from home. Similarly, it is the means by which the lecturers deliver lectures.

The study focuses on the Centre for Research and Continued Engineering Development (CRCED-VAAL), Faculty of Engineering of North west University, South Africa. CRCED leaders have shown interest in setting up a virtual mobility project for the centre and this inspired the author towards the achievement of the task.

Most of the students' assignments are currently submitted through the use of e-mail. Interaction between the lecturers and the students are often made by the use of the same technology. Presentation of lectures and research work of the students are exhibited with the use of multimedia devices like projector and digital board.

This centre has adopted virtual mobility partially and therefore needs to fully implement virtual mobility in its educational process. However, quite a number of foreign students (especially Nigerians) are presently participating in the program.

Apart from other factors hindering travel to the school, incentives to reduce costs, time spent, and willingness to substitute the trip with virtual communication dominates reasons why there is the need for virtual mobility in learning. Thus, the research focuses upon professional communication concerning learning and thus excludes most private communications.

## ***1.5 Research Design***

The research presented in this dissertation is the result of a research journey that has two major and distinct sources- namely, the primary data source and secondary data source. As explained in the previous section, there are four questions that need to be answered in order to complete this research work. These questions will be answered by collating the information gathered from both the primary and the secondary sources.

### ***1.5.1 Primary Data Sources***

***Selection of methods for information gathering*** - Primary data was collected via questionnaires, interviews and through online discussion groups. These were done with the intention of collecting quantitative information from statistical analysis of the data, as well as qualitative information from comments given in the questionnaires. The questionnaires used in these surveys are located in

Appendixes I and II. In addition to the questionnaires, a number of interviews were conducted in person, web-chat and group mails.

***Organisations & Institutions studied*** - A number of ICT companies, universities and colleges lecturers, students and workers were involved in the research. Selection of the organisations was based on the following basic criteria and preferences: Organisations should have experience of the virtual communication activity of interest and they should be willing to participate in the survey. The lecturer, students and individuals were anyone who showed interest in the survey and was willing to participate. In addition they were preferably drawn from different types of institutions of different sizes and geographic distribution (regional, national, international).

### ***1.5.2 Secondary Data Sources***

Gathering information has been an ongoing process throughout this project. Virtual mobility is a relatively new concept and as such, literature with this particular topic is limited but expanding. Information was collected from a number of related disciplines, mainly e-learning, telematics – particularly telework and teleconferencing. Virtual learning has been the main area of interest, but e-learning and telework have also been an important focus in the information gathering.

For most of the subjects studied, the changing character of the subject required continual updating of the material. The technological development of ICT is extremely fast, and the prerequisites for use of the technology are constantly changing, including the conditions for the applications studied.

Computers have become communication tools and have moved into homes and schools, the Internet and e-mail have boomed. Cameras have become common on computers, and so on. Following this development, people's behavior is gradually changing, both inside and outside the organisations walls. This development had a number of effects on this research.

The Internet has also proved to be an increasingly common source of information. Firstly, the information can be (and usually is) updated often, which reflects the development of the entire ICT

industry, and is a necessity when studying these issues. Secondly, users of the relevant ICT-applications often also use the Internet for communication and documentation.

### ***1.5.3 Source Criticism***

The material gathered in this research covering technical issues may quickly become dated. In order to minimise this problem, most of the primary information in the research was gathered during a short time period. In addition, I set my focus more on people's ability to adapt to new applications offered by the technology, and less on the technology itself, the findings should have a value beyond the next computer model.

## ***1.6 Dissertation Structure***

The dissertation consists of six chapters. A brief description of each chapter in this dissertation is the subject of this section;

*Chapter One: Introduction.* The present chapter gives the reader an insight into why this research was carried out and why this dissertation was written. Moreover, the chapter defined some technical terms and described how the research was conducted. The focus and the scope of the research were subsequently defined.

*Chapter Two: Literature Survey.* In this chapter, the virtual mobility concept is introduced and discussed. Moreover, each of the literature surveyed is presented in sequence and organised format. Summary and detailed discussion on some of the important literature on this topic is presented.

*Chapter Three: Research Design and Methodology.* This chapter explained the design of the sample techniques employed during the data collection. It also described the procedure used in capturing and editing data and how data analysis is carried out. It finally, enumerated the shortcomings and sources of error.

*Chapter Four: Results Presentations and Discussion.* In this chapter, I present the results of my findings and discuss them with respect to the research questions. Starting with the presentation of

some basic characteristics of traditional classroom, and followed by a presentation of the method adopted for their transformation to the virtual classroom. Moreover, barriers for such a transformation are discussed. In addition, how to overcome these barriers in order to promote a shift towards virtual learning is discussed. Finally, the future developments in virtual learning environment are analysed.

*Chapter Five: Virtual Mobility Applied.* In this chapter, a virtual classroom is designed and implemented, based on the media surveyed and the VLE observed. The use of local area network (LAN), wireless local area network (WLAN) and virtual private network (VPN) in conjunction with Microsoft "NetMeeting" for implementing virtual classroom is discussed. A procedure to "virtual mobilise" CRCED Vaal, Northwest University is discussed and the business opportunities from such an implementation are enumerated.

*Chapter Six: Conclusion and Recommendations.* This chapter concludes the previous chapters' work. The main conclusions from the entire research are presented, the constraints faced during the work are discussed and questions and suggestions for further research are listed.

## **1.7 Summary**

In this chapter, we introduced the topic: Virtual mobility in tertiary education and the rationale behind the selection of this topic. Some technical terms that may not be easily understood by an average person were defined. I stated the research methodology and scope of the project and finally, explained the skeletal structure of the whole dissertation.

Chapter 2 will introduce the concept of virtual mobility. Virtual mobility will be defined and the different types of spaces and mobility will be discussed. I will present the review of the literature studied and give a summary of their conclusions.

# CHAPTER

## TWO

### ***2.0 Literature Survey***

Chapter 1 explained the background, the purpose and the scope of this study. This chapter presents the virtual mobility concepts and the summary of related literatures on earlier works. The common nomenclature is the term “virtual mobility”. The focus of this chapter is to gather information about this research topic. The literature is organised in the order of date. This chapter concludes with a summary.

### ***2.1 The Virtual Mobility Concept***

Mobility is everywhere. The human being needs to move to perform activities to satisfy basic and secondary needs. We move for working, eating, learning etc. The satisfaction of human needs cannot be accomplished by staying in the same geographical environment, even in the most primitive societies.

The evolution of human societies brought new needs, societies rapidly became more complex, and the human being felt the need to struggle against distance and time to satisfy these needs. The development of international trade and cultural exchange was responsible for the appearance of this need. Mobility became a need in itself, and after satisfying it, we can then achieve other goals associated with other needs. These needs account for why we invented ships, cars, planes, and built all kinds of communication devices.

#### ***2.1.1 What is Virtual Mobility?***

The concept of virtual mobility is closely associated with the word *accessibility*. In geographic literature, “accessibility has been considered the opportunity individuals have to participate in necessary or desired activities or to explore new ones” (Silvio, 2006:7). “This opportunity is dependent on their ability to reach the right places at a reasonable time and at a reasonable cost in terms of resources and effort” (Couclelis, 2000:12). With the advent of ICT, technology offers a

viable and often preferable alternative to physical movement for accessing and engaging in economic, social, and cultural activities.

The term virtual mobility is not new, and has been used to describe a wide variety of phenomena, including different e-learning activities. Clearly defining and explaining the term 'virtual mobility' in use of this work is therefore important, as it runs the risk of becoming one among numerous vaguely interpreted terms appearing in ICT and Information Society literature.

We can therefore describe the basic idea of virtual mobility as an ICT facilitated opportunity to *access an activity* that normally would require a person to move physically. Kenyon et al. who define virtual mobility in their work on transport, social exclusion and the Internet, give a definition that encompasses this idea:

*'Virtual mobility' is a shorthand term for the process of accessing activities that traditionally require physical mobility, but which can now be undertaken without recourse to physical travel by the individual undertaking the activity'. (2002:4)*

Thus, virtual mobility creates accessibility opportunities, both substituting for physical mobility and enabling access where previously there was an accessibility deficit. However, as the focus of this dissertation is to examine ICT applications that can substitute travel to various campuses for learning purposes. The definition applied here is limited to virtual mobility in tertiary institutions and is given as: *Providing access to learning in tertiary institution by means of ICT, thereby substituting the need for traveling to campus.*

### **2.1.2 Types of Spaces and Mobility**

Mobility implies a change of place from one point to another in a given space, usually geographic space, but there are other types of space. For the specific objectives of this paper, three *types of space and mobility*: (namely, *geographic, social and virtual.*) will be distinguished.

**Geographic space and mobility:** This is the physical space, in which we live and to which we refer as our place. Our location and movements in geographic space can be described and

measured in terms of coordinates: latitude and longitude. Human society is based on a geographic space. There is a complex interaction between the human being and his environment. The movement of people from one point to another within this space is called *geographic mobility*.

**Social space and mobility:** This space is defined and delimited by the set of human relations resulting from the social interaction between human beings. Every person has a position (or status) and functions (or role) in a social space. He participates in several social groups during his life, to perform diverse types of activity; working, learning, entertaining, social, religious and cultural participation, etc.

*Geographic mobility and social mobility* can occur independently of one another or at the same time, and one type of mobility can influence the other. For example, a person can move from one city to another (*geographic mobility*) to undertake new professional activities of a higher socio-economic position (*social mobility*) or he can move geographically without altering his social position and role.

We can also move in social space in two ways, horizontally and vertically, and the types of social mobility resulting from these movements are called, *horizontal mobility* and *vertical mobility*, respectively. In *horizontal mobility*, we change from one social environment to another without changing our hierarchical position in the two environments. An example is moving from one job to another in a different organization, of the same hierarchical position, or moving from one University course to another in the same subject area. *Vertical mobility* involves a change in the social position and possibly functions, of a person in a social space. One example is the promotion of a person to a higher degree in his professional career.

Social mobility involves also a change in our network of social relations and cultural patterns, and is a mental representation. We cannot see people moving from one point to another in social space as we do in geographic space. However, we can see the cultural symbols and material objects indicating that the person has moved horizontally (from one organization to another) and/or vertically (a new office related to a higher-level managerial post to which he has been promoted).

Finally, a person can move to live (temporarily or relatively permanently) from one city to another to get a higher-level job and to a different enterprise. In this case, all kinds of mobility have taken place: to a different city (geographic mobility), to a different organization (horizontal social mobility), and to a higher-level job (vertical social mobility).

**Virtual space and mobility:** The development of the "information and communication technologies" and large telematics network like the Internet, created new possibilities and new phenomena. It is now possible to move from one place to another in a new space called *virtual space* or *cyberspace*, without moving geographically, and to do things of many kinds, anytime, anywhere.

The human dream of defeating space is now almost possible, thanks to a new type of mobility called *virtual mobility* enabled by computer-mediated communication. Virtual mobility is a means to attain vertical social mobility while partially or totally avoiding geographical mobility.

Education is one of the means of attaining social mobility. Geographical mobility often becomes impossible due to ones social status, nature of jobs etc. Therefore, virtual mobility is the tool that can be used to attain the social growth (social mobility) without recursion to real physical travel (geographical mobility).

## ***2.2 Literature Review***

Fifteen reference sources were reviewed, among which four papers were classified as being related to "ICT, mobility and accessibility". Seven papers are related to "ICT and learning" while the remaining four are related to "collaboration tools and virtual learning environments (VLEs)".

I reviewed each one of these papers by starting with an introductory paragraph. The content of the research was summarised in the paragraphs that followed the first, while the last paragraph discussed the conclusions made by the author.

These papers were evaluated in such a way as to give us the trend in the development of our concepts (virtual mobility, e-learning, VLEs etc). From these we were able to derive the need for our study, on how virtual mobility can be applied to learning, preferably, in tertiary education.

### ***2.2.1 Literatures Related to ICT, Mobility & Accessibility***

**PAPER 1:** UK department of transport, "The Virtual Mobility Knowledge Base: The impacts of ICT on travel behaviour and freight distribution patterns" 6 Aug. 2006. <http://www.virtual-mobility.com>

This paper was the result of a project commissioned by the UK department of transport. The department's aim was to build up its knowledge and understanding of research in this area. The key applications that are making an impact on travel behaviour and the way things are transported were identified, some of which includes and not limited to e-work (telework, telecommuting - all the forms of remote work using ICT), e-business & e-commerce (business to business and business to consumer online transactions and service/product delivery) and e-services (e-government services, e-learning, telemedicine, etc).

The paper concluded that, all the activities mentioned above in principle, imply that physical travel is replaced by online activities using the new ICT. Nevertheless, the impact is not as straightforward as that. The paper suggested further research into how virtual mobility can: replace travel, work alongside physical travel, generate new journeys and redistribute travel and goods transport - in terms of time, location and who does what.

**PAPER 2:** HOP Associates and Transportation Research Group, (the University of Southampton), "Virtual Mobility: Taking forward the research agenda in the UK". 8 May. 2006. <http://www.flexibility.co.uk/issues/transport/virtual-mobility.htm>

This paper evaluated the impact of teleworking, e-commerce and other online services on transport. It took a rigorous and structured approach to the evaluation of this impact and also evaluated the relevance and transferability of the methods used into the current UK context.

The outcomes of the research done by the author of this literature are:

- There is a considerable weight of evidence that two forms of teleworking, home-based and centre-based, have a significant travel reduction effect.
- Other forms of teleworking (e.g. mobile) have not been sufficiently studied to draw firm conclusions.
- There is no robust data to support the conjecture that telework contributes to urban sprawl or decisions by teleworkers to move further away from the workplace.
- There is a great deal of theorising about the effects of e-commerce - but there are almost no studies that use data beyond extrapolation from figures of current supermarket visits.

This paper in many respects concludes that, it is too early to say what the effects of these activities will be on transportation. The "positive" conclusion is that telecommuting clearly contributes to travel reduction, even when other trips by the telecommuter and household members are taken into account. One interesting, and possibly controversial finding, is that there is no strong evidence for wider knock-on traffic generating effects and this could be that the data is simply lacking.

However, it seems in the literatures, that a body of (mostly US) experts have concluded in the "substitution<sup>3</sup>/complementarity<sup>4</sup> debate" that complementarity wins. Nevertheless, the conjecture about complementarity remains a conjecture. There is much research to be done. But in the meantime, individuals, organisations and policy-makers should feel confident that there is value in using telework to reduce travel.

**PAPER 3:** Kenyon S. (2002). *Virtual Mobility – Implications for Social Exclusion and Travel*: A paper presented by the Transportation Research Group (TRG), in collaboration with the Centre for Human Service Technology (CHST), at the University of Southampton.

This paper presents the results from a series of focus groups, undertaken in 2001, as part of a study into the links between (lack of) transport and social exclusion and the possible role that virtual mobility could play in helping to alleviate (for some people, in some situations) mobility related exclusion.

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<sup>3</sup> Substitution – To put something or someone in the place of another (Longman English Dictionary, 1997, pg 1056)

<sup>4</sup> Compliment – To supply what is lacking to make something complete (Longman English dictionary, 1997, pg 205)

The paper begins by introducing the links between transport and social exclusion, discussing ways in which, mobility-related exclusion could be overcome by introducing the concept of virtual mobility. It also discusses the findings in two broad areas. Thinking about transport; considers participants' current transport use and the role of transport in their every day lives. Thinking about ICTs; discusses the level of exposure to Information and Communications Technologies amongst the participants in the focus groups; their Internet perceptions; their current and future Internet use and, linked to this, participants' acceptance of virtual mobility.

Some of the findings of this research work include: Lack of adequate mobility disproportionately affects people who experience other forms of social exclusion. Where people experience economic exclusion, they cannot afford to pay for transport to meet their needs; where they experience spatial exclusion, because of the geography of where they live, public transport does not serve them, making access to a car essential.

In addition, lack of access to adequate transport is *reinforcing* social exclusion. It is also suggested that lack of access to transport can actually *enforce*, or create, social exclusion. For example, people may be unable to find out about employment opportunities, because they cannot get to the job centre. They cannot attend interview, or accept a job, because they would not be able to travel to the place of interview or employment. Therefore, the person is unable to work and remains on a low income. Similarly, lack of transport to places of learning can prevent people from gaining the qualifications necessary for employment; or prevent people from participating in social networks, that is, meeting with family and friends, or meeting and making new friends.

This paper suggested that the primary purpose of mobility is not mobility per se, but accessibility: to goods, opportunities, services and social networks. Thus, where the aim of mobility is access, perhaps it is more useful to consider increasing *access*, rather than increasing *mobility*, for some people, in some situations. Thus, virtual mobility could create accessibility opportunities. It could substitute for physical mobility, or enable access where previously there was an accessibility deficit.

The paper concludes by highlighting the implications of the findings for both social and transport policy in the UK. It also informed us that the Internet is being used to conduct activities that traditionally have been conducted offline, the majority of which, when undertaken offline, would require physical mobility, in either accessing or undertaking the activity.

The Internet could therefore, be having an effect on transport. This effect could be two fold. It can substitute for some activities, largely daily activities including shopping and banking, whilst at the same time it can supplement current activities, enabling participants to fulfill a greater number of activities, many of which they are currently excluded from, because, in whole or in part, of inadequate physical mobility.

**PAPER 4:** Arnfalk, P. (2002) *The Role of ICT Based Communication from a Pollution Prevention Perspective*: Doctoral dissertation, Lund University.

This thesis introduces the role of virtual mobility, i.e. various possibilities of substituting travel by the use of ICT-based communication, in reducing environmental impact from travel in Swedish organisations.

The thesis focuses on virtual meetings, such as audio-conferencing, videoconferencing and web-meetings, and their actual uses as well as potential substitution of business trips. Particularly audio-and videoconferencing was empirically found to substitute travel in organisations, but the use of virtual meetings is still limited. This fact was discussed by highlighting the benefits and costs of business travel and a number of limiting factors for the virtual communication technologies. The paper also brought up some suggestions on how to enhance the use of virtual meetings.

It further evaluated the relationship between virtual mobility and pollution. Increase in the number of automobile leads to a corresponding increase in pollution, as a result of CO<sub>2</sub> emissions from the automobile. In conclusion, the paper argued that pollution could be reduced if our various commuting activities could be substituted by virtual mobility applications such as web meeting and teleconferences.

### ***2.2.2 Literatures Related to ICT & Learning***

**PAPER 1:** Laurillard, D. (2002). *Rethinking University teaching in the digital age*. A paper presented at the Open University, UK

This paper emphasised the pressing needs for higher education to meet the demand of knowledge society by taking full advantage of the possibility technology presents, to move teaching and learning into new era. It identifies the role of the university in the digital age as the provider of knowledge that enables people to maintain an independent understanding of itself and its world.

The teaching method has not been sufficient for university to fulfill its mission. As a result of this, the author of the paper felt that a radical shift from the current model of knowledge transmission is needed. She opined that a re-design of the curriculum in such a way as to provide collaboration between tutors and the students was required. Such a situation, that allows both the former and the later to work jointly on a project.

Lastly, the paper suggested a model for conversational framework for learning, a new approach in which there exist an iterative dialogue between the teacher and the students. This dialogue operates on two levels, the discursive, theoretical conceptual level and the active, practical experimental level. The paper concludes that higher education must support a professional approach to teaching that mirrors that of a research.

**PAPER 2:** English S. & Yazdani M. (2002) *Computer Supported Cooperative Learning in a Virtual University*. A paper presented at the Department of Computer Science, University of Exeter, Exeter, UK

This paper introduces the concept of learning through a virtual University. The purpose is to provide a new perspective based around cooperative learning, which incorporates peer tutoring and peer assessment. It proposes using standard communication technologies of the Internet and the Web and to benefit from the developments in computer aided learning and artificial intelligence.

A case study of a project undertaken by a student was cited. In this project, students in teams of four were observed over a period of 22 weeks. The purpose of team meeting observation was to identify the nature and type of communication skills in use, in particular, to try to define consultative and advisory techniques employed by students. The overall plan was that the resulting information would contribute to the design and development of the new media computing degree programme.

The outcome of this project threw up several unexpected outcomes. Firstly, it was an uphill struggle to make contact and establish communication with the students. Despite assurances given at the start that all information collected would be in complete confidence and would not affect grades. Six teams opted out and five out of the remaining seven failed to share information during group meetings.

Secondly, the Bulletin Board was unpopular. Several possible reasons have already been listed, but there seemed to be a snowballing effect - there were some keen students introducing themselves in the first week, but when little response was made, interest was lost. It was also frequently expressed that students had daily contact with each other and there was no perceived need to use it.

The nature of the observed team meetings showed that this was not a favorable context to achieve the original purpose of the observations - to define consultative and advisory techniques used by the students. It was evident that students possessed a variety of skills and expertise, which were known and accepted, by the other team members, but little information was either sought or shared between them. This was particularly noticeable in respect of those students who were confident and skilled programmers and were therefore allocated the role of 'chief programmer' for a specific part of the task.

Students' comments showed that some were frustrated due to an unreasonably heavy workload, while others were frustrated because they wished they knew more about what was going on. These were comments made in conversation with the researcher, rather than within the team meetings.

Team skills were shown, particularly in the areas of management of information and management of task. The areas where less skill was observed (and commented on by the students) were

regarding group and personal needs. Very little time was spent on reviewing work done or giving feedback whether it was constructive comment or praise and value for individual team members. In one team, there was a strong personality conflict, which affected the whole team and was never resolved. This demonstrates the need for some training and experience in the development of cooperative learning skills.

The paper based its conclusions on the observation of the cooperative learning already taking place at Exeter University's Computer Science Department. Where it was shown that:

- cooperative learning may be more effective when explicit awareness of personal transferable skills (PTS) is demanded and intentionally practiced;
- learning groups need to be cultivated in their growth of mutual trust, understanding, respect for others and honesty;
- the facilitator (tutor or course leader) has an important role to strike the desired balance of motivator, mentor & mediator which can affect the success or failure of a learning group;
- Computer supported learning is most effective when it provides a solution to an identified problem in an existing (on campus or at a distance) learning environment.

**PAPER 3:** Silvio, J. (2003). Global learning and virtual mobility. (In Varis, T., Utsumi, T. and Klemm, W.R. (Eds), *Global Peace through the Global University System*. pp. 67 – 91). University of Tampere, Hameenlinna, Finland

This paper introduced the concept of virtual mobility and considered the characteristics of the family of concepts describing the processes to which virtual mobility is closely related (i.e. virtuality and virtualisation). It also gives an insight into the interaction between mobility, virtual learning and working. In addition, it analysed selected experiences in which the virtual mobility have been used for lifelong learning of the workforce and a better distribution of knowledge, especially those resulting from cooperative projects involving universities, enterprises and governments.

The first initiative promoted by the European Commission involving geographic mobility and internationalisation of learning was the ERASMUS project. Launched in 1987, the ERASMUS Programme supports, promotes and stimulates cooperation between European universities, by exchanging students, exchanging staff, developing joint curricula, and developing intensive short

courses. In 1996, a virtual counterpart and complement of ERASMUS was created: the ERASMUS Virtual University project, which attempted to complement through virtual mobility the geographic mobility stimulated by the parent ERASMUS programme (EVU, 1996). However, the Erasmus Virtual University had a very short life and the project was abandoned.

Another program discussed by the paper is the ERASMUS Virtual University which has at present, has a follow-up in the project called VirtUE (Virtual University for Europe). The VirtUE project was set up as a pilot action for the launch of a European Tertiary Distance Education Network, based upon classical universities, open universities, technology providers and telecommunications operators. During the two-year project, which started in 1996, three models for network-based educational services were set up and tested: Virtual class, virtual campus, and network of distance education and training.

Nevertheless, the author also wrote about the SOCRATES project of The Coimbra Group network. This is a network of 33 traditional universities from 18 European countries, and is one of the networks that have been working to introduce ODL concepts in traditional universities. They have received European funding for various projects that enable students and staff to gain experience with virtual mobility.

Two important examples are the HUMANITIES project and the VirtUE project. The pilot phase of the HUMANITIES project started in 1995 and involved 26 Coimbra Group universities. It aimed to introduce a structure for virtual mobility through telematics-based distance learning. The model chosen was characterized as a 'hybrid' model, meaning that distance education components are integrated within a traditional classroom-based course. In 1996, a continuation of this project was approved by the Commission; more universities and enterprises specialised in open distance learning were drawn into the project.

Another project already executed according to the author is the VSM (virtual student mobility project) which is also part of SOCRATES, and had two-year duration - from 1996 to 1998. Its overall intention was to provide the non-mobile EU students with the opportunity to become virtually mobile by creating six cross-cultural virtual learning environments on the Internet, which the students from the participating universities could attend. The courses were taught differently in

different EU cultures so that students may be exposed to up to six different European cultures. As narrated in the paper, another aim of the project was to evaluate the organisational obstacles of using its approach to ODL and how they may be overcome. The results of the project showed the power and drawbacks of virtual mobility in lifelong learning.

The author confirmed that all institutions involved in the VSM project gained a lot of experience in the potential and drawbacks of electronic teaching and co-operation. The ability to exchange students virtually and the possibility of using technology in teaching as probed by the VSM project are two matters that have important implications for all institutions. However, as the VSM project showed, virtual settings require close co-operation and co-ordination and hard work pedagogically, technically and administratively.

In line with the author's view, the project 'Virtual Mobility and Distributed Learning (VMDL),' was also another project involving the concept and practice of virtual mobility, within the framework of the European program, Human Capital and Mobility (HCM). The objective in this case was to study the efficiency of different modalities of working at a distance with researchers with an accent in the construction of human networks through technology. The project has reported in the paper lasted only one year in 1995.

The paper discussed another interregional initiative promoted by the EU with the United States of America, like the ATLAS Project. ATLAS is a project that aims to increase the cooperation between European and USA universities. Five European and five North-American research-based engineering schools participated in the project, developing an international student exchange programme and a virtual learning environment. The duration of the project was from September 1996 to July 1999. The main actions of the project included, virtual mobility through the use of ODL courses and new technologies, across-Atlantic student exchange, targeted study packages, and development of credit transfer systems.

The paper concludes with proposals and strategies to achieve a better distribution of knowledge through virtual mobility, and the articulation of virtual mobility with other types of mobility in lifelong learning.

**PAPER 4:** Sonja, V. (2003). *Virtual mobility in reality*. A study of the use of ICT in Finnish Leonardo da Vinci mobility projects: The Finnish Centre for International Mobility CIMO, Finland.

This paper described what the reality of using ICT in mobility projects is and how it can be used in planning and realisation of these projects. It looks into what kind of ICT equipment and applications are used in projects, to what extent and for what purposes. It further described how different ICT tools have been used during different phases of various projects executed in the past. Obstacles and good practices in the use of ICT in international mobility projects were critically discussed.

In addition, the report figured out what virtual mobility in Leonardo mobility projects really means at present. It presented the dimensions of possibilities virtual mobility offers. It also produced guidelines and a tool to help project coordinators plan the use of ICT in mobility projects.

Despite the fact that a possibility of combining international mobility and e-learning into virtual mobility is a topical issue now. Virtual mobility on the net will probably never replace the traditional (physical) mobility completely, because interaction via technology is always restricted and one cannot really experience the feeling of living in another culture through virtual contacts. However, a great deal can already be done on the net. As this paper concludes that effective use of ICT requires that all partners have the equipment, time, skills and willingness to use new technology.

**PAPER 5:** VandenBosch, H. (2004) *Virtual Mobility: New steps towards increasing student's mobility*. Open University of Netherlands

The content of this paper is not so comprehensive but it nonetheless, listed the objectives of mobility of students which include but is not limited to motivation of students to study abroad: to gain international experience and competence and to approach other (often more specialised) study opportunities. It further elaborated on the achievement and concerns of virtual mobility. The literature carried out a comparative analysis of the differences between the physical mobility and virtual Mobility.

The paper gave an overview of some selected case studies in Netherlands and also identified the community of interest in the study of virtual mobility. Details of the different forms of mobility was listed and finally, the paper listed the barriers to the development of virtual mobility, among which is, legislation and public perception (often, no official recognition of distance learning qualifications, regarded as inferior qualifications) and the fact that, foreign language skills needed in reading, writing and speaking is a prerequisite.

**PAPER 6:** Vries, F. (2004). *The Regional Dimension of the EU e-Learning Agenda: European Union Project Proposal.*

This paper provided a summary of key e-learning benefits, seen by the regions surveyed. Although most regions agreed on key benefits, some differences appeared in their context of e-learning. Some regions focused on specific benefits of improving and extending distance learning, others emphasised the advantages of transforming the learning experience, as well as promoting blended learning strategies within the classroom. A few regions saw the potential of empowering learners through informal e-learning approaches, capitalising on the potential of the Internet to create flat, horizontal information and learning paradigms.

Conclusions from the paper indicate that regions are key players in promoting e-learning and contributing to the adaptation of society to the knowledge economy. While the problems of e-learning range between cost, time and lack of access, there are more benefits and results of e-learning.

**PAPER 7:** Bijnens H. (2006). *The Integration of Virtual Mobility in Europe.* Euro PACE

This paper explained several facts about student's mobility in Europe. A fact that physical student mobility is still marginal in Europe in 2000 is an example. The European commission had set a goal in its integrated action programme of lifelong learning. This program is tagged ERASMUS. The idea was to set a target whereby in the year 2011, 3.000.000 of all European students should participate in the Erasmus programme. However, about 80% of the Students do not have an

opportunity to participate in the ERASMUS for social, financial or other reasons. Therefore, the need for virtual mobility schemes was conceptualised. This was called Virtual ERASMUS.

The paper further listed several benefits postulated in the virtual ERASMUS project. These benefits are;

Virtual Mobility of teachers and students enables them to benefit linguistically, culturally and educationally from the experience of other European countries and of their (academic) fields of study. Both students and teachers will develop the necessary skills needed in working life where internationalisation is becoming increasingly important.

It can create a sense of European citizenship in teachers and students who learn to work together in cross border teams. Furthermore, virtual mobility enables European wide exchanges for all those not able to benefit from existing face-to-face programme, due to social, geographical or other reasons.

According to the paper, virtual mobility initiatives at the institutional level enhance sound competition between institutions and thus contribute to the competitiveness and attractiveness of the educational offer. It also provides enrichment to the regular educational environment of all institutions.

This paper concludes with information regarding establishment of a body by the European commission named – “BEING MOBILE”. The purpose of this body is to create awareness for virtual mobility applications in Europe. It will also manage a targeted dissemination activity, in the form of a workshop, a conference, a publication and a website where all initiatives in the field of virtual mobility and their outcomes will be promoted.

### ***2.2.3 Literatures Related to Collaboration tools and VLEs***

**PAPER 1:** Kent L. Norman, (1997). Teaching in the Switched On Classroom: An Introduction to Electronic Education and Hyper Courseware

This paper introduces the concept of an electronic classroom. An electronic classroom was described as a type of real classroom with both the learners and the teacher sitting behind their respective computers. The computers are interconnected by a Local Area Network. A switchboard connects the lecturer's computer, a projector (an electronics board), VCD/DVD players and VHS player. This arrangement makes it possible for the lecturer to deliver lectures via a PowerPoint presentation and play audiovisual material to the students.

The paper concludes with the systematic procedures on how to use a "Hyper Courseware"; an online application that can be used as a virtual learning environment for the provision of online or electronics lectures. This application has several menus, such as lecture schedule, a link to an online library, quizzes and tests, group chatting, assignment and feedback, progress report monitoring etc.

**PAPER 2:** Britain S. (1999). *A Framework for Pedagogical Evaluation of Virtual Learning Environments*. University of Wales – Bangor

This paper identified a number of ways in which virtual learning environments (VLEs) may assist with learning and teaching in higher education. Most of the benefits of VLEs lie in their potential to support styles of learning that are especially time-intensive for university teachers using traditional methods, but which have always formed a core part of a university education. Referring in particular to: collaborative learning, discussion-led learning, student-centered learning and resource-based learning.

According to the author, "these learning styles have been supported using tutorials, seminars and small-group project work. However, these activities have increasingly been squeezed out of undergraduate timetables in recent years, due to factors such as increased time pressures on staff, increased student numbers and increased economic pressures".

The literature investigated a number of well-known or innovative VLE products, some of which are commercially produced; others are the result of university development projects. For each VLE the

paper compiled a feature set list from the various sources available. It argues that although feature sets give an indication of the individual tasks a software package can perform, they fail to capture the overall picture of how well designed the software is, for supporting the integrated student activities .

In addition, the paper put forward two models, (one from an educational perspective the other from an organisational perspective) that could be used to provide a more effective evaluation framework for VLEs. The two models are complementary in many ways, having different scope and orientation.

The paper concludes that online learning technologies and virtual learning environments in particular are attracting considerable attention within UK higher education and it is likely that emerging systems will have considerable impact on the way that learning and teaching is conducted in universities.

**PAPER 3:** Richardson J. A. (2000). *A Large-scale 'local' evaluation of students' learning experiences using virtual learning environments*, London, SE5 9RJ United Kingdom

This paper provides an overview of a learning model and its implementation. Firstly, the model and evaluation instruments were described. Secondly, the method and key findings were discussed. These highlighted that students need to feel more supported in their learning, they need more cognitive challenges to encourage higher-order thinking and also that they prefer to download their materials to hard copy.

In addition, tutors need to have a greater awareness of the ways individual differences influence the learning experience and strategies to facilitate electronic discussions. Generally, there should be a balance between learning online and face-to-face learning depending on the experience of tutors, students, and the subject.

In 1997-8 Staffordshire University introduced two Virtual Learning Environments (VLEs), Lotus Learning Space and COSE (Creation of Study Environments), as part of its commitment to distributed learning. An ambitious and wide-reaching evaluation model has now been designed to

appraise the quality of students' learning experiences using these VLEs. The intention has not been to compare the environments, but to focus upon their common elements.

As the evaluation generated a substantial amount of data from a range of sources, this paper uses a series of key questions to structure the results. It considered whether there was evidence that:

- Students had a positive learning experience using VLEs
- Students were encouraged to learn 'actively' using VLEs
- Individual differences influenced the way students approach and work with VLEs
- Students used the online course rooms to discuss their learning

This literature's research report revealed some important issues. Almost all students felt very positively about using virtual learning environments, if the qualities of the traditional environment could be retained. For example, they still wanted face-to-face seminars and lectures, but also to have supporting materials on their VLE. They also wanted the opportunity to feel a part of a physical group, and favoured face-to-face discussion rather than using online or electronic methods.

Clearly, the holistic nature of this study generated a substantial amount of data, which could not all be fully analysed here. However, from the data presented in this paper, several key conclusions were drawn:

- When VLEs are designed so that they focus on passive strategies (content-driven, poor support and little use of ESDs), students are critical and highly instrumental in their use of these VLEs.
- When elements of the VLE supports active learning (e.g. successful use of the course room) these are much better received.
- A balance between learning online and face-to-face learning is required. It there may be a need for a transitional period for students and tutors. This would allow tutors to receive greater feedback regarding the VLE materials they have produced, and students would feel they had the opportunity to bring their problems and ideas together with other learners and their tutors.
- Students need to have more opportunities to discuss their learning with other students non-electronically. The most successful model for encouraging asynchronous discussions involved

student teams, to meet in person to discuss ideas and then presented their findings to the other students for comments. This reduced the frustration that students felt with asynchronous methods.

- Tutors need to have a greater awareness of how to facilitate electronic discussions.
- A range of individual differences influences the quality of the learning experience.
- Students report they feel less part of a learning community. Strategies need to be explored such as more successful use of the course rooms, to combat this.

**PAPER 4:** Breu S., Lehner F., & Nösekabel H. (2005). *LL2 (Learners Learn 2gether) - a P2P-Based E-Learning System*. University of Passau

This paper introduces the concept LL2 (Learner Learn 2gether)—An E-Learning Application. A new technology creating new opportunities in the field of e-learning is peer-to-peer (P2P), which is not only a new technology but also a new paradigm within electronic communication. P2P refers to participants in a network which are "equal", who conduct collaborative processes without the need for a central co-ordination, and who mutually allocate resources. It can be considered to be the counterpart of the client-server architecture of traditional e-learning environments or learning management systems.

The development of a new e-learning tool called Learners Learn 2gether (LL2) has already started. This tool addresses the problem of high entry barriers for campus-wide e-learning solutions. Furthermore, it tries to meet the demands of modern educational systems; the aim is to develop LL2 as desktop as well as mobile solution, which will interact with existing e-learning environments (e.g., Online Campus Passau)

P2P technology can be used in several areas, e.g., to support collaboration in workgroups. A well known groupware application with an underlying P2P network is Groove [gro]. It offers the usually required functionality for file sharing, coordination of meetings and projects etc. Some initiatives exist that try to combine e-learning with the new possibilities of peer-to-peer networks. Some of them were explained by this literature.

This paper concluded that the current state-of-the-art in P2P e-learning covers only part of the requirements and the development is slow. Products, which are currently supported and developed are; SWAP, SeLeNe, Groove, Edutella, and S2S. Groove is a groupware solution lacking educational functions and S2S focuses on scientific knowledge management, educational functions are also missing in this application

The authors also emphasized that the major problem seems to be the size of the user base for each project. Few projects were able to create the required critical mass of users which, as a result, hinders acceptance, growth and development. Besides, most do not offer all functionality and features related to e-learning. LL2 therefore, aims at improving the state-of-the-art significantly by providing an active P2P e-learning solution and network.

In conclusion, the authors argue that a critical mass of users need to participate in LL2, first to provide statistically valid evaluation results, second to build the user base, which ensures continued usage, and third to develop and improve the software and optional modules. This will be guaranteed by many international participants in the project, including universities and groups not only in Germany but also in Finland, Hungary, Czech Republic, and Austria.

### ***2.3 Summary***

The papers addressed Information and Communications Technology (ICT) based communications and the two interrelated topics of virtual mobility and e-learning and the corresponding collaboration tools. The main idea conveyed by each paper was presented and in some cases, recommendations of the paper were listed. Similarly, the conclusions reached on each of the papers were respectively presented.

Nevertheless, the papers that centered on virtual mobility gave an awareness of the possibility of attaining some level of accessibility achievement via the ICT communications without recourse to the physical travel. Similarly, the papers on Learning threw more light on the use of ICT communications in the provision of qualitative education and other pedagogical possibilities, while those on collaboration tools gave us an awareness of the various collaboration tools or virtual learning environments available.

By relating the information provided by the papers, with a specific focus on what virtual mobility can offer learning and how the collaboration tools, can be used for learning implementations. I therefore, chose the topic on the use of ICT in the provision of e-learning with all the pedagogical advantages of virtual mobility vis-à-vis its application in the tertiary institution. These ideas suggested the topic: "Virtual mobility in Tertiary education" to the author of this work.

In Chapter 3, I will perform a documentation of the research design and discussions on the methodology followed during the field experiments and finally, perform the analysis of my findings, which in turn, will be followed by the presentation of results.

# CHAPTER

## THREE

### ***3.0 Research Design and Methodology***

In the previous chapter, virtual mobility concepts were introduced and some selected works related to this topic were reviewed. This chapter addresses research design and the approaches used. The design modes adopted in this project are outlined in Section 3.1; the main data sources are described in section 3.1.1. This is followed (section 3.1.2) by a description of the various methods of investigation used. Similarly, the data analyses (section 3.2) are explained and presented. I listed the sources of errors in section 3.3 and finally ended the chapter with a brief summary (section 3.4).

### ***3.1 Research Methodology***

In carrying out this work, I used a method which focused exclusively on one or more of the following:

- technological innovation and description;
- theoretical exploration of possible technology-based futures;
- Organisational/developmental investigation into non-traditional ways of teaching and learning as alternatives to the bureaucratic/hierarchic model.

Against the above paradigm, I decided to work with 200 people because of the difficulties attached to reaching out to a larger number in terms of the time available for the research. Hence, a number of higher institution students and lecturers from South Africa and Nigeria were contacted. These countries were chosen because of my frequent shuttle between these countries during the period of carrying out this research. Questionnaires were distributed to those whom I could physically contact and otherwise, mailed to those whom I could not physically contact.

Similarly, a few selected technocrats in the fields of ICT were interviewed both in Nigeria and in South Africa. While a face-to-face interview was conducted with some of these people, an online

chat method was used in interviewing the others. The overall approach used in conducting the field work will be explained in the subsequent sections.

### **3.1.1 Overall approach**

People and their attitudes toward the use of technology were to be studied and their dynamics dissertated without intervention by the researcher. Such an approach is rooted in a qualitative methodological orientation, which means that data were not weighted based on frequency of occurrence, but based on their descriptive usefulness. In other words, an intervention was not necessarily considered more important because it was repeated by more people, but because it provided useful understanding of how the community worked. This notion corresponds to Van Maanen's definition of qualitative methodology as:

*"Arrays of interpretative techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less natural occurring phenomena in the social world" (1983:9).*

This approach was adopted in the expectation that additional insights might be uncovered that would be inaccessible to external observers. Data derived from this line of investigation was compared with data derived from the investigations of the other communities.

The methodologies adopted by the project were influenced by the nature of the research questions and by the nature of the other distributed research groups that the project selected to investigate. The research questions evolved partly as a result of the self-reflection on the need to create more accessibility for learning, and partly due to the simplicity, flexibility and variability provided by the ICT communications, which can be applied to teaching and learning. Hence, the methods used evolved during the course of the project (despite the short period available for the research).

### **3.1.2 Phases of the research**

An iterative design was adopted that had three main stages (the literature survey, the pilot empirical study and the final empirical study), totaling up to 24-weeks duration.

**Phase one** – (May 2006 – July 2006): During this period, the basis for the survey was prepared following a traditional pattern of literature study, development of a conceptual framework, and refinement of research questions.

**Phase two** – (July 2006 – August 2006): During this period, a pilot empirical study was conducted on few selected sample community prior to the detailed investigation. This community includes the higher institution students, lecturers and various professionals in the ICT industries. The selection of each community sample cut across different higher institutions in the selected countries.

**Phase three** – (August 2006 – November 2006): After the pilot empirical studies (as explained above), some noticeable error were found in the questionnaires and the interview questions. The questions were adjusted accordingly. After the adjustments, detailed investigation was carried out. The survey was conducted (largely by questionnaires, mail-questionnaire, interviews and online forum) on the selected distributed research communities. These were followed by data analysis and reporting.

### **3.1.3 Data sources**

This project drew upon three main sources for its study data:

- The response of the research groups to the distributed questionnaire
- Semi-structured face-to-face interviews with some members of the research groups; and
- Observation and evaluation of some collaborations tools

**Literature-based research** - As mentioned above, the first eight weeks of the project were largely devoted to literature-based research. This process helped in identifying the variables on which the studies would focus and in arriving at a shared understanding of the meaning of these variables in the context of the distributed research communities.

**Questionnaire** - In this case, two questionnaires were designed one for the learners and the second for the teaching and support staff (Appendix I and II). The generic interest in these is not only in the use of technology, but to discover how people use technology and how valuable technology is to teaching and learning. The parameters of interest include people and technology;

the values and usage of technology in teaching and learning, the technical support services available to users and lastly, the curriculum and learning material resources. These data were used to some extent, in my analyses of the investigation, but time and resources did not allow full exploitation of this data source.

**Interviews** - The majority of data were gathered through in-depth face-to-face interviews, allowing direct interaction, thereby facilitating the elaboration of answers, and the adoption of flexible and context-sensitive questioning procedures. Whilst this approach offers the potential of richer data than do structured questionnaires, it places reliance upon interviewer sensitivity and bias. This approach was piloted to minimise unwelcome side-effects and sharpen the way the main interviews were carried out.

In the first stage of the research (referred to as the pilot stage), I designed another questionnaire (Appendix III) and interviewed a few number of colleagues who are ICT professionals. In the second stage, I interviewed a selected number of people in our community of interest (mostly, experts in the ICT industries). The first purpose was to evaluate and refine the understanding derived from introspection, thereby cyclically exploring other people's perceptions. The second was to pilot the interview techniques, approaches and questions iteratively, thereby attempting to minimise bias and maximise question relevance. The response to the interview questions was documented and analysed.

An Evaluation of the above processes reflected the need for the restructuring of the Interview questions. The Interview question was re-designed (Appendix IV) before the major Interviews were conducted. A documentation and Subsequent analysis of the finding then follows.

**Observations** - In an opportunist way, I observed and/or participated in a number of other research communities. Of particular interest was their use of communications media, which were not really explored by many of the respondents but could be useful for the research work. These included video conferencing, real-time electronic conferencing on the World-Wide Web and some other online collaboration tools.

### **3.2 Data Analysis**

At the end of the field work, a number of data were collected and documented. These data need critical analyses so that reasonable findings and conclusions can be derived from it. The data was analysed using the approach of Rubin and Rubin, which they described as follows:

*“Data analysis begins while the interview is still underway. This preliminary analysis tells you how to redesign your questions to focus on central themes as you continue interviewing. After the interviewing is complete, you begin more detailed and fine-grained analysis of what your conversational partners told you. In this formal analysis, you discover additional themes and concepts and build towards an overall explanation. To begin the final data analysis, put into one category all the material from all your interviews that speak to one theme or concept. Compare across the categories to discover connections between themes. The goal is to integrate the themes and concepts into a theory that offers an accurate, detailed yet subtle interpretation of your research arena. The analysis is complete when you feel that you can share with others what your interpretation means for policy making, for theory and for understanding the social and political world” (1995:226 – 227).*

In line with the above, the outline of the analysis is as follows: Out of the 200 questionnaires sent-out to the learners, only 152 were returned. This number represents 76% of the targeted community. In a similar manner, 47 (78.3%) out of the 60 questionnaires sent out to the teaching and support staff were returned. In addition, a total number of 25 technocrats and academicians were interviewed in a face-to-face manner.

The analyses of the investigation were carried out with the aid of Microsoft Excel. This tool was chosen because of the simplicity it offered the much needed quantitative analysis expected of this work. It is equally one of the best tools available for tabulation and for plotting graphs. The ease of use is also one of the major reasons for using this software.

The questionnaire was designed in such a manner that, it makes selection of choices easier for the respondents. A particular question expects a respondent to select one or more of the available

options. The same questions were transferred from the questionnaire into an excel worksheet with the corresponding choices of the respondents.

As I was receiving the questionnaires, they are constantly tabulated into the Excel worksheet (prepared as explained above). The idea was to count how many respondents choose which option of the questions (see appendix V). After the completion of the tabulations, the total numbers of respondents that choose a particular option were known for every question of the questionnaire.

However, at a point, the analysis was a little bit meaningless; therefore, there is the need to make it meaningful. I therefore, converted all the counted numbers into percentage for every question in the questionnaire (see appendix VI). The intention here was to know the percentage of people that chooses an option to those that chooses another option on the same question. This was done for every question of the questionnaire.

Finally, the result at this point becomes clearer and ready for presentation, discussion and interpretations. These will be followed by conclusion and lesson learnt from this research work. The next chapter will elaborate on this.

### ***3.3 Sources of Error***

My 24 weeks of research on this work was, stressful and remarkable. Despite all efforts at making sure that, the work minimises error to the barest minimum, possible sources of error were still noticed to have existed in this work. These cannot be over looked, but need to be mentioned so that subsequent work on this topic can take note of them and correct them.

Firstly, Gathering information has been an ongoing process throughout this research. As for most subjects studied, the changing character of the subject has required continual updating of the material. The technological development of ICT is extremely fast, and therefore, the material gathered in this research covering technical issues may quickly become outdated.

Secondly, the different characteristics exhibited by the respondents from the countries interviewed are good enough for research of this type. This could have been better if samples were taking from

people all over the globe because of the global nature of this topic. Hence, the streamlining of the area investigated into two countries may have effects on the outcome of the research.

Thirdly, my understanding of the respondents response (for example, response from students whose knowledge and understanding of English language is still low) to my questions may not actually corresponds with what they intended. This is an error and cannot be overlooked.

Lastly, the human bias, which was, actually the reason for conducting the pilot studies cannot be totally eradicated from the data collected; this also influenced the results of the research.

### ***3.4 Summary***

This chapter has discussed exhaustively the research design and the methodologies used in obtaining the data for this project. I explained the various instruments used in collecting the data, the sample community and the reason for chosen the sampled community.

I explained what motivated the starting of the analysis right from the time the interview started and also discussed the statistical tool used for the quantitative analysis and how the qualitative analysis of the data was carried out. Finally, the sources of errors as noticed during the course of the field work were documented and discussed.

The next chapter will however, do a presentation of the results and take a look again at the research findings vis-à-vis the research questions. It will explain the findings on the research in relation to the questions upon which this work based its research. These findings, (as spelt out by the research questions) will then be used as the bases for the work in chapter five (virtual mobility applied).

# CHAPTER

## FOUR

### ***4.0 Results Presentation and Discussion***

The last chapter discussed the research design and the methodology used in this project. I performed the analysis of the data obtained from the investigation and documented the sources of errors as noticed in the data. This chapter will however, present the result of the analysis. This will be followed by a discussion of the results with respect to the research questions. This chapter will be concluded with a summary.

### ***4.1 Presentation of Results***

As mentioned in the previous section, the outcome of the fieldwork was documented and critically analysed. However, the result of the findings will hereby be presented one after the other. Some of these outcomes will be summarised and interpreted at the sectional level, while the summary for the others will be outlined during the general discussion of the result in subsequent sections (section 4.2).

#### ***4.1.1 On the Use of Technology***

In an attempt to know how people use technology, the findings revealed the following: Over 58% of the teaching and support staff claimed to be enthusiastic over the use of technology. Another 64% of the sample have used ICT for communications, 60% have used it for students assessment, 76% for marking, 68% for keeping records, 49% for tracking learners progress while some other 87% of the respondents uses ICT for feedback. <sup>5</sup>

Learners were requested to provide answers to same questions as those given to the teaching and support staff but in a slightly modified form, on the use of technology. The feedback revealed that, out of the 152 responses obtained, 83% of these learners have used a Microsoft office package, another 81% have studied using CD/DVD, and 80% have found study materials on the Internet, (65% on the Intranet). A large number of people (81%) have used E-Mail, 56% and 55% of the

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<sup>5</sup> All the respondents can select more than one option.

learners have done self assessment and online test respectively while another 68% have used chat room to interact.

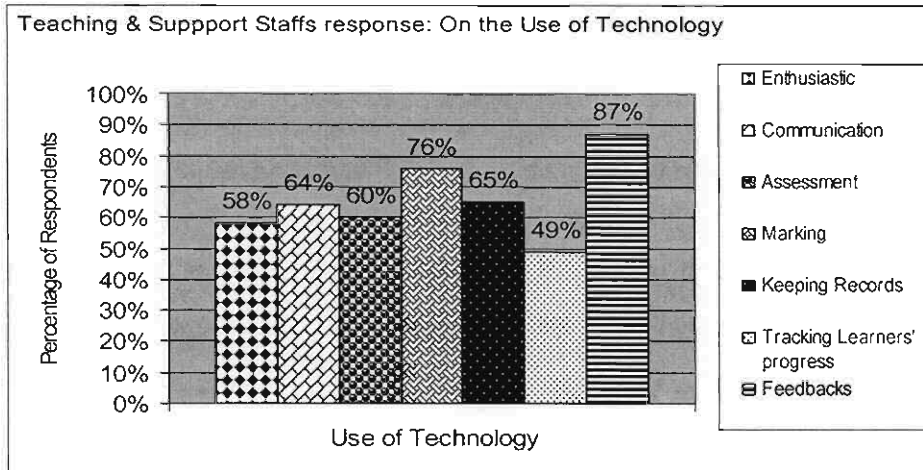


Chart 4.1 – Teaching and Support staff Response: On the Use of Technology

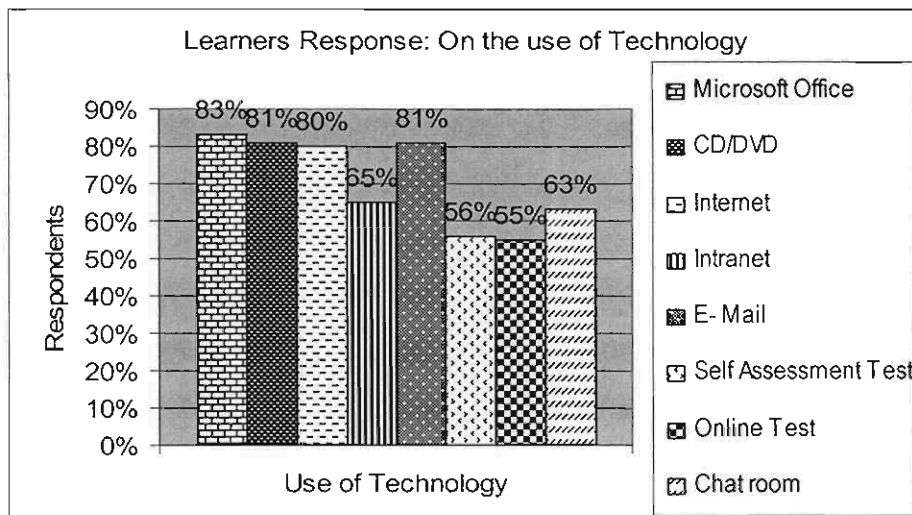


Chart 4.2 – Learners response: On the use of Technology.

#### 4.1.2 On Technological Support

The use of technology requires the necessary support for the users of technology. Therefore, a number of supports related issues dominate reason why people were not willing to use technology. This was the reason why enquiry was made into the support already available to people and those still been expected by the people. The outcome of this investigation will give me an idea of the support requirements of technology users.

On the support already received by the users: 94% of the respondents have received satisfactory support on hardware related problems. Another 77% of the same sampled communities have received support on software related problems and equal numbers of users have received training on technological support. In addition, 63% have received support on teaching/learning materials while only 51% have received support on virtual learning environments (See Chart 4.3).

Similarly, on the areas where support is still required, about 79% of the respondents need more help on General IT problems. Very few percentages (33%) need support on Network related problems and 61% requires help on the use of VLEs while 85% of the users need help on special learning software and 56% of the sample requires help on Power Point Presentations (See Chart 4.3).

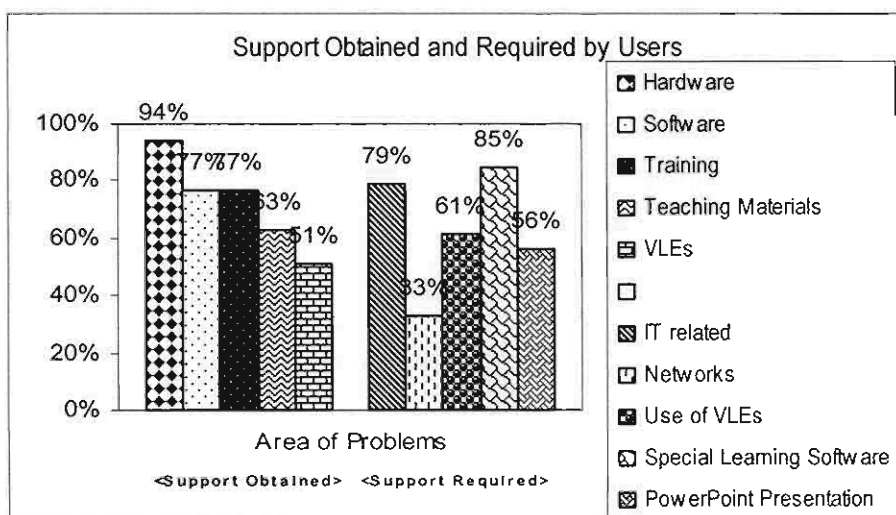


Chart 4.3 – Support Obtained and Required by Users

On methods of support and the effectiveness of such methods: My investigation reveals that people have received the following methods of support in the past: Face-to-face support, E-Mail support, dedicated help desk, telephone support, dedicated class and self-support<sup>6</sup>. The effectiveness of these support methods according to the investigation is tabulated in table 4.1 and graphically presented in the chart shown below (chart 4.4).

<sup>6</sup> A personal effort towards solving problems. This may be in form of searching for solution to the problem on the internet or reading the equipment's manual etc.

Type of Support	Respondents
Face to Face	22%
E- Mail	21%
Help Desk	13%
Telephone	12%
Dedicated Class	14%
Self Support	17%
Total	100%

Table 4.1 – Methods of Support

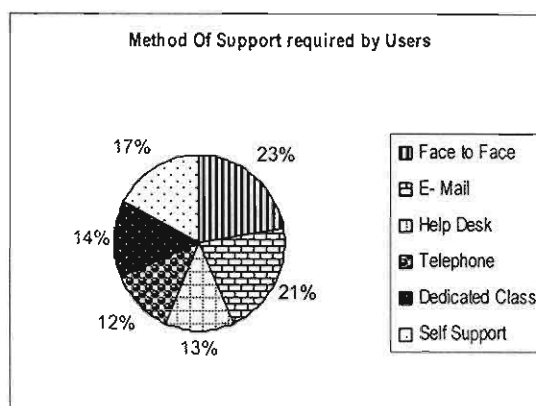


Chart 4.4 – Methods of Support Required by People

### 4.1.3 On ICT Impact and its Learning Outcomes

Application of ICT to learning has a certain impact on learning and these impacts have corresponding outcomes. Evaluation of the outcomes was derived from the response from 47 teaching and support staff and 152 students (total 199). The results are presented in the table (table 4.2) below.

S/N	IMPACT / OUTCOME	No of Responses	Percentage
1	Enjoyable Learning experience	198	99.63%
2	Easy record Keeping	169	85.13%
3	Motivates students	140	70.21%
4	Better records Keeping	136	68.08%
5	Allow More Learning	135	67.76%
6	Provide better job	130	65.31%
7	Allow Better grades	124	62.50%
8	Improve attendance	110	55.32%
9	No Response (No option was chosen) <sup>7</sup>	104	52.03%
10	Improves Retention	97	48.93%

TABLE – 4.2 – The response on the impact / outcome of ICT application on learning

<sup>7</sup> A responder can chose more than one answer thus, an empty space was tabulated as 'no response'

#### 4.1.4 On Teaching/Learning Contents

Teaching and learning contents refer to those technological tools that can be used for teaching and learning. I investigated the different types of tools that are usually put into use and those that can be used for teaching /learning. My findings revealed that many people have used stand-alone PCs, E- Mail, Class notes on regular bases. A few people have used an interactive white-board (Netmeeting), data projectors or a networked PC. In addition, very few have recently used mobile devices, video conference and audio conference for teaching/learning.

This finding reveals that teleconference (video conference and audio conference) and mobile devices are new technology that just found its usages in the midst of the people. This explains why the people that use them are quite few. On the contrary, E- mails and stand-alone PC have found their usage in the daily activities of man for years back and therefore, more people have used them. The percentages of the learners, teaching and support staff that have used each item are tabulated and the averaged value presented in the chart shown below.

<b>Teaching/Learning Tools</b>	<b>Teaching/Support Staff (%)</b>	<b>Learners (%)</b>	<b>All the respondents (%)</b>
Stand alone PC	79.36	92.77	86.065
E- Mail	74.47	86.84	80.655
Class notes	70.21	75	72.605
Interactive White board	55.33	55.26	55.295
Discussion Board	68.08	63.15	65.615
Data Projectors	41.06	53.95	47.505
Networked PC	78.36	44.74	61.55
Mobile Devices	29.79	46.06	37.925
Audio conferences	12.77	32.9	22.835
Video Conferences	12.77	23.55	18.16

TABLE 4.3 -- A Table indicating people's response to the usefulness of teaching/learning contents

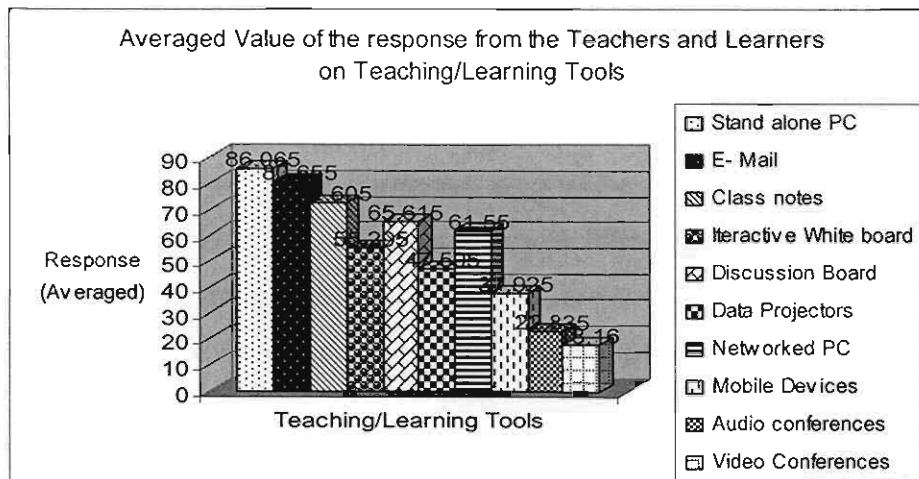


CHART 4.5 – A chart indicating people’s response to the usefulness of teaching/learning contents

#### 4.1.5 On Technological Barrier

Technology has not always been as easy as it looks. There is no perfect system anywhere in the world, the use of ICT in teaching/learning has its pros and cons. The latter was my concern for this section, because there are several factors that hinder the successful implementation of technology for meeting or collaboration. In order to find these factors, I investigated the technical and technological barriers of ICT applications with respect to learning. My findings shows that the list of the barriers were so numerous, which may be the subject of a research project of its own.

The responses obtained from the investigation show that lack of electronics “course content” leads among these factors as 85% of the respondents were of this opinion. 83% attested to the fact that ill-equipped teaching room is another factors. Another factor affecting the proper application of ICT to learning is the time to prepare learning materials, the materials to teach electronics contents need enough time for their preparation and such time according to 83% of the respondents were lacking. About 77% believed that the equipment to carry out virtual teaching and learning are just lacking in the institutions. This is a factor, which has to be considered during the design and implementation of virtual learning.

Other noticeable barriers of ICT applications with respect to learning and the corresponding percentage of the sampled community that attested to them as factors to be considered are;

peoples resistance to change (68%), unreliable networks (62%), students reluctance to use the material (62%) and the lack of support and guidance (55%) - (see chart 4.6).

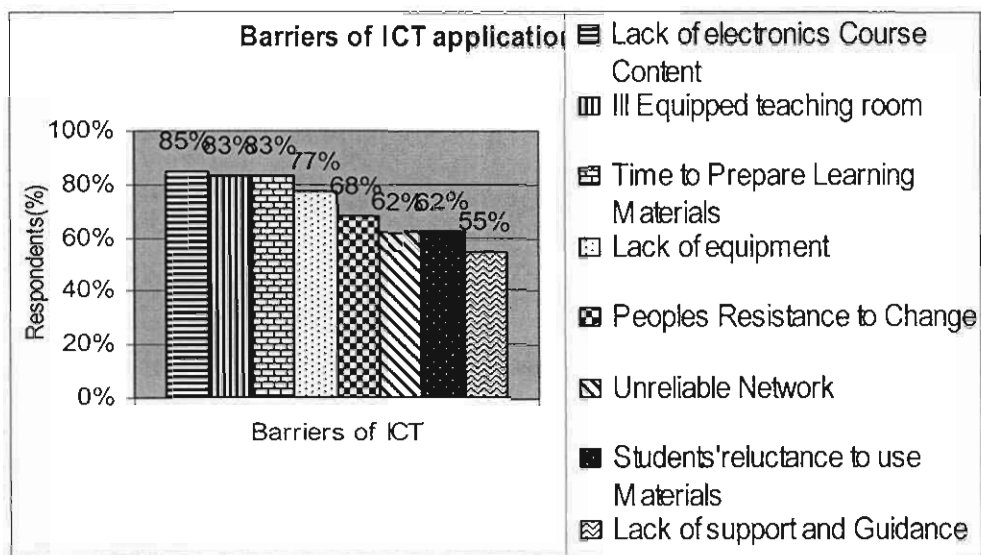


CHART 4.6 – A chart indicating the barriers of ICT applications in learning

#### 4.1.6 Interview on Virtual Media

In a quest to know about virtual media available for interaction, meetings and collaboration, I interviewed about 25 ICT technocrats and academician. The purpose of this was to acquire direct knowledge from these people and to receive detailed explanation on issues surrounding the use of virtual media. As explained in Chapter 3, the essence of the investigation is not to choose a medium for the implementation of our virtual classroom based on the number of people that have used it. We shall rather, select our choice of medium for collaboration between the students and the lecturer, student and co-students by the functionalities it offers and the quality of its usefulness. The quantitative analysis is just to capture the trends in the use of technology whereas the qualitative analysis will be used to mark out the best tool for which purpose.

About 92 of the respondents use E-Mail on a regular basis, out of this figure about 52% are always irritated when reply to their mails were not received on time. Similarly, 80% of these people are very comfortable receiving and replying mails. Also, 64% of the people interviewed have participated in Netmeeting out of which 60% have confidence using this medium, 36% of this group

can start Netmeeting without assistance and 20% can use Netmeeting when given assistance during meeting startup. 8% of this group has never used Netmeeting.

Teleconference: 64% and 44% have used audio conference and videoconference respectively in the past. The general opinion about these media was that one partner gets irritated when the other partner lacks the expertise of the media. However, 52% of the people interviewed will most likely replace normal physical meetings with audio conference and 48% will do the same with videoconference if the sound and picture quality can be improved.

Finally, about 76% of the 25 people interviewed agreed that work does not provide time for learning and further studies but a substantial number of the respondents (88%) opined that they will enroll for virtual learning if available because of the constant need to update their knowledge.

In conclusion, more people will like to use these tools when their quality is improved upon and when all users of the tools are well trained on the best way to use the media. If this is done, there is an assurance that more people will embrace virtual learning.

## ***4.2 Discussion of Results***

The results displayed above show that people have been using ICT for their various day-to-day activities. Many of the activities performed by the people are carried out with the aids of technology. However, as the technology progresses and people discover its uses, they quickly adapt to its application. From this investigation, it was realised that, where technology had already found usage long time ago, such as the use of Microsoft word, communications and E- Mail, there are more people already using them than in those areas where technology usage is just emerging such as online test, tracking learners' progress and so on.

Technology usage and technological support are two variables that are inseparable. Therefore, help and support will be needed by the users of technology. The outcomes of my investigation show that, support has been very good and satisfactory in the area of training, hardware and software related problems. However, support need to be improved upon, in the area of network related problems, the use of VLEs, special learning software and Power point presentations.

Where support has been useful and satisfactory, face-to-face type of support has been found to be the most effective method. This is because the users of the tools and the support personnel have to physically meet to discuss the problem. They can look into the history of the problem together and the frequency of the problem can equally be discussed. This will make it easy for the support staff to quickly detect and resolve problems. Dedicated Help desk is another means of support that was found to be very effective. This method provides a department solely responsible for support services, hence they are always available to assist and support the users.

From the above discussions, a number of lessons have been learnt. One major lesson is that as more technology is embraced and applied to our daily activities, so also should the support services required (to make this experience enjoyable) be available in an effective manner. This will make users enjoy their experience with the use of technology rather than becoming frustrated over the use of technology.

Meanwhile, the application of ICT to learning will make the learning experience more enjoyable, motivate students and provide chances for more people to learn. It will also make marking (i.e. electronic marking using magnetic ink character recognition technology), progress tracking and record keeping easy for the teachers. How will these be possible? This will be possible only when the right teaching content is applied for the right purpose. For example, E-Mail can be used for the coordination of lecture schedules and for sending assignments. Teleconference or Interactive white board could be used for delivering lectures while a web page can be used for record keeping, progress tracking and registration of semester courses. There is no best content for all-purpose.

Technology has come to stay, but the sustenance of technology in our daily activities depends on how we tackle the barriers facing our use of technology. For Instance, electronics course content, electronics classroom and electronics equipment for teaching and learning are still missing in our institutions of higher learning and where available, they are either insufficient or not functioning properly. There are situation where the equipments function properly but the technical expertise at the part of the users or the reluctance to change made them abandoned these equipments. These

barriers need to be worked upon and solutions proffer, if the use of technology in learning is to be made successful.

Although, human beings usually react to change, but as they realize the usefulness and richness of the change, they embrace it thereafter. Therefore, the use of ICT in learning (virtual learning) may have a setback from people reluctance to change when introduced but will surely be embraced.

Having presented the result of my investigations, analysed this results and performed the interpretation of the outcomes in a generic manner, it will be appropriate to link these outcomes to our research questions, which were the reasons for the investigation. Therefore, the following section shall attempt to answer the research questions with respect to our research findings.

#### ***4.2.1 Virtual Learning versus Traditional Learning***

##### **Can Virtual Learning Replace Traditional Learning?**

Current educational virtual environments are large, extensive and can be difficult to define as they are constantly changing and evolving. They often range in the level of interactivity they offer and the variety of services they provide. "If we consider virtual schools, we can possibly make a division into three possible broad categories: independent, collaborate and broadcast". (Russel, 2001:23).

- Independent models can often be referred to as "asynchronous" because they do not rely upon direct communication between teachers and students, as they do not avail of chat or videoconferencing facilities. Students access and interact with materials at their convenience and so the learning structure is considered unscheduled.
- Synchronous models usually involve more communication and collaboration through videoconferencing and live chats so there are more opportunities for socializing. As online meetings between lecturers and the learners are usually scheduled and there is limited flexibility.
- Broadcast models allow students to access lectures or broadcasts on the Internet and so interaction is often limited.

These different models give an example of the wide range of learning flexibility offered by these virtual environments that serve the individual needs. It is therefore not surprising that we have witnessed such a move towards interactive learning in such virtual environments. The fact that virtual learning is already complementing traditional learning, and as internet continues to grow and sophisticated learning devices and software emerges we can therefore, conclude at this point, that virtual learning can actually replace traditional learning.

**CASE STUDY: Virtual Versus Traditional Classroom** - Jerald Schutte at Northridge randomly selected half of his students to be taught through traditional in-class lectures and written assignments, while the rest of the class learned through text posted online, email and real time chat with classmates and electronic assignments. Both groups were given identical tests under the same conditions and there were no significant differences between the age, gender and computer experience of the groups involved. What is astonishing about the results was how quickly the students adapted to the virtual classroom and formed peer groups online as compensation for not being able to converse in class. Students in the virtual class spent 50 percent more time working with each other than their counterparts in the traditional classroom.

These results were quite confounding at the time as little experimental evidence had been generated to demonstrate the effects on student performance in virtual versus traditional class formats. The results contradict popular hypotheses that face-to-face teacher-student interaction results in a more valuable experience and produces better results. Schutte observed that the traditional classroom could sometimes be an inhibiting environment for students, and its structure can be pressurising and intimidating. Whereas the virtual environment encourages freedom of expression and students are more open to communicate and express opinion and would often thrive in these environments. However, while it is unlikely that the virtual classroom will replace the traditional classroom as an educational medium completely, there is no doubt that interactive learning in virtual environments will become more common as the technology advances.

#### ***4.2.2 The Transformation***

**How can we Transfer the Traditional Classroom to the Virtual Environment?**

In a physical classroom there is a standard set of equipment and tools, this usually includes audio-visual equipment such as textbooks, a chalkboard, video player, and tape recorder. Virtual environments need equivalent equipment and tools in the form of network-based software application to allow a group of instructors and students to carry out the teaching and learning process.

The sophistication of such software structures vary widely, from simple electronic mail systems to systems that have been specially enhanced to support classroom-like experiences, such as virtual auditoriums. Some of them are well established on the Internet and new ones are still emerging.

**The Textbook:** For centuries, textbooks have been the most important teaching and learning tool at all kinds of schools. They provide the teaching plans for the teacher, help the teacher and students to orientate in the curriculum content, provide background materials and direct the student's understanding and learning.

In spite of that, there are certain restrictions of the traditional textbook; above all, the physical format of the textbook does not easily allow student and teachers to depart from the prescribed path, or to link to new concepts and ideas from other disciplines (Liaw, 2000:17). Virtual textbooks are a new tool. Siegel and Sousa state that:

*"The goal of virtual text books is to move learners beyond content mastery to information-seeking and problem solving skills that include, evaluating and synthesizing information from diverse sources; understanding and applying the difference between fact and opinions; grasping multiple and diverse perspectives; and drawing insights from these perspectives within the context of one's own knowledge base and experiences". (Siegel and Sousa, 1994)*

The Web seems to be more suitable for this than the traditional textbook in many ways. The information can be delivered in both linear and non-linear format as it can be presented via multimedia with text, pictures, video, sound, and animation. Vast amount of information can be searched, reorganised and downloaded from decentralised worldwide digital libraries.

Furthermore, the quick-delivery feedback ability of the web can make learning more effective (Liaw, 2000). Nevertheless, there may be some drawbacks in using electronic textbooks. Above all, they sometimes do not provide all of the details that users need or conversely insufficient emphasis on good human-centered design of the interface and huge amount of information results in information overload and frustration of the users.

**The Chalkboard:** Most teachers make use of a chalkboard for further clarification of a point. The instructor of an electronic course might make use of the shared whiteboard to answer questions from students. Such tools allow images to be displayed, manipulated, annotated, and shared between two people or among a whole group, (Turoff, 1995:19). It is offered by a tool like NCSA College (NCSA, 1994) which combines communications software tools with "NCSA scientific visualization software", allowing researchers to conduct virtual collaborations. In these sessions, students can share data visualisation and create documents collaboratively.

**The sound system and face-to-face interaction:** An important part of the physical class environment is the personal interaction as questions are asked by the students. Allowing all students to hear the questions and answers helps everyone to learn and encourages additional questions.(Turoff, 1995:24) List-servers can be used to redistribute e-mail messages, Usenet newsgroups, computer conferencing and collaborative work spaces may serve for sharing this kind of interaction.

A newsgroups example can be found at [usenet.org.uk](http://usenet.org.uk). These are rather simple methods and provide asynchronous interaction. More dynamic question and answer interaction can be created using text-based chat sessions, text-based virtual learning environments or net-based virtual auditorium or lecture room systems. (Alberta, 1999:9)

The simplest method is text-based chat, which can run on almost any hardware, providing text only chat. Text-based virtual learning environments also do not have high demands on user hardware and speed. They equally, offer their users the opportunity to create their own text-based rooms and learning environments. The net-based virtual auditorium or lecture room systems are more

sophisticated, they provide voice communications and more features of traditional classroom such as slides, application sharing and students' feedback.

When using computers to substitute for face-to-face interaction, why do we have to go beyond e-mail and newsgroups? According to Ehrmann and Collins "there are two major reasons: interaction among students is a powerful catalyst for improving learning outcomes and second, collaborative skill is itself an important yet often vestigial outcome of higher education" (2001:7).

**Video player:** Mpeg movies and audio clips can be used as effective additions to textual information. Movies and cartoons can be used to illustrate or explain a procedure and audio clips might be helpful to describe a particularly difficult point. It can also make rather dry or long material more attractive, just as video can be used in traditional classrooms to keep the students' attention.

**Video teleconferencing:** The attractive presentation of the teaching material is not the only reason for using video in virtual learning. In traditional learning environments, much information is transferred through the body language of the teacher. Hand motions and details such as facial expressions enhance the students' understanding. In addition, teachers may miss the direct contact with their students.

Videoconferencing is another virtual classrooms media. The frame rate and quality is often poor with generally small image size and slow refresh rates and this frustrates the users a lot and makes its use scaring. The most common systems are Microsoft NetMeeting, CuSeeMe and QuickTime. "After the quality improves, the use of video teleconferencing could enhance electronic courses not only by transferring these forms of communication but also by providing visual and audio cues which help the instructor and students to form an informal rapport". (Turoff, 1995:26).

### ***4.2.3 Technological Barriers involved***

#### **What are the technological Barriers involved in the Implementation?**

Developing software systems for supporting virtual education is still problematic. The same functionality must be available for all popular user platforms (the absolute minimum is the Macintosh and Microsoft Windows systems). Bandwidth limitations must also be considered

because limiting participation to those users with the best Internet access and hardware equipment is unacceptable.

Figure 4.1 illustrates some of the factors affecting successful use of ICT applications in teaching and learning (especially in tertiary institutions). Sixty percent of projects had encountered some kind of problems with the use of ICT. The most common problems were concerned with functioning, availability or compatibility of equipment and connections, and data protection issues (Sonja, 2003:6)

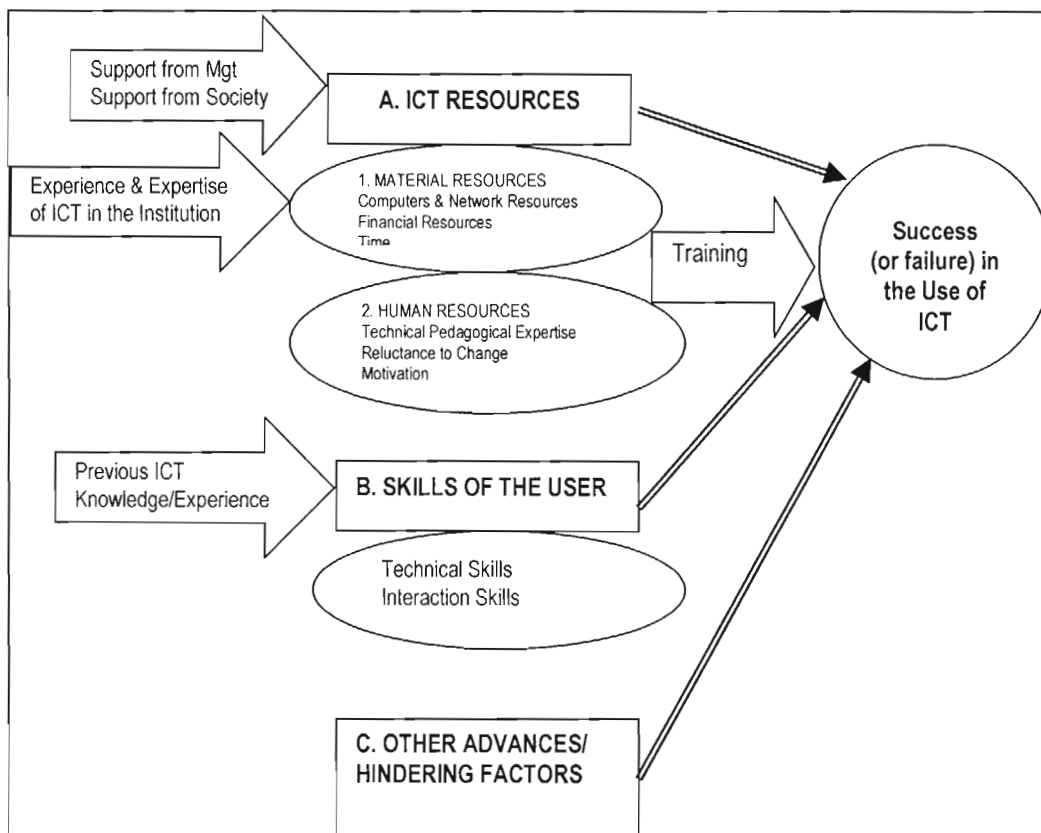


FIGURE 4.1 - Factors advancing and hindering successful use of ICT

There were often big differences in available resources and skills between different users. The financial support of the institution owners, its infrastructure, support from management of participating organisations, and their general expertise in ICT affect available ICT resources in projects to a great extent. Detailed discussions about available resources and about ICT skills of

users in the planning stage of a project and preparation for possible needs for further training will help successful use of ICT.

If users can meet in person before continuing interaction on the net, communication will be more successful, since this increases commitment of the communicating partners and makes communication more natural between them. One significant factor for successful use of ICT is to build on already existing systems.

Use of ICT in a mobility project can be linked to larger ICT development projects in organisations. Due to lack of skills, time or money, it is often not possible to develop very complicated new ICT applications in a mobility project. Many projects mentioned the need for extra funding, and many projects that had used ICT to a greater extent had secured extra funding from different sources.

#### ***4.2.4 The Future Developments in Virtual Learning***

##### **What is the future Developments in the Virtual Learning Environments?**

During the research work (particularly during the literature survey and interview), some future developments in ICT were identified. These may be useful and have a beneficial impact on virtual learning. These new developments include but are not limited to IP Version 6, new networks, wireless connections, PDAs and Haptic interfaces.

**IP Version 6 (IPv6):** With the Internet doubling in size every 10 to 12 months and the market increasingly demanding live audio and video transmission over the Internet, these demands bring about the next generation of Internet protocol that will be able to cope with these rapidly escalating users volume and traffic demands. IPv6 is the result of 7 years of work by the Internet Engineering Task Force (IETF) to find a successor for the Internet Protocol version 4 (IPv4). This development will soon be rolled out to the market.

As Virtual learning increases, so also will the virtual learning equipment required increase. Technology is also growing in the direction of making all the appliances (used either at home or at work) use the Internet protocol (IP). The demand that will be placed on the Internet and the users will be enormous such that the IPv6 will be the winning solution. A solution that will make the

control of all the equipments easy for the users since everything can be controlled from one source (the user's computer).

**New Networks:** We cannot learn in isolation and therefore, in good practice; students are guided through direct, face-to-face contact with teachers. This is an issue in current virtual learning applications. The quality of images produced by web cams and the internet connection speeds have an effect on the quality of interactions between teacher and student. However, various research into these problems have produce two technologies tagged the Internet2 and Geant.

- **Internet 2:** Internet2 is a not-for-profit advanced networking consortium comprising more than 200 U.S. universities in cooperation with 70 leading corporations, 45 government agencies, laboratories and other institutions of higher learning as well as over 50 international partner organizations.

Internet2 is working with level 3 communications to provide the U.S. research and education community with a dynamic, innovative and cost-effective hybrid optical and packet network. The new network is designed to provide next-generation production services as well as a platform for the development of new networking ideas and protocols. With community control of the fundamental networking infrastructure, the new Internet2 Network will enable a wide variety of bandwidth-intensive applications under development at campuses and research labs today.

- **Geant:** The GEANT project was collaboration between 26 National Research and Education Networks representing 30 countries across Europe, the European Commission, and DANTE. Its principal purpose was to develop the GEANT network - a multi-gigabit pan-European data communications network, reserved specifically for research and education use. The project also covered a number of other activities relating to research networking. These included network-testing, development of new technologies and support for some research projects with specific networking requirements.

The Geant provides a pan-European network at such high speeds that it completely dwarf the internet, as we know it today. With projects such as Geant, virtual learning environments would be able to employ tele-immersion to enable real-time tutorials and meetings between teacher and students. This would also use the haptic technology (described later) so that objects could be handled even though they were thousands of miles away. This network has also been able to include curriculum areas that have been, until now, less suited to a virtual learning environment.

These projects have been developed to provide faster and more powerful means of communication. It has been reported that, Internet2 is providing connections up to 1000 times faster than in domestic situations, allowing not only faster access to information but opening up new possibilities for communication. These projects have been setup by academic and research facilities (Internet2 is American, Geant European).

The University of Washington in Seattle, which has been sending High Definition Television over Internet 2, reports that the images are as good as 'the best photographic plates'. This will push the boundaries of video conferencing allowing the transport of TV-quality pictures, which will improve real-time conferencing between student and teacher. Experiments have already been carried out in a violin master class at the University of Oklahoma, where pupils and teacher, separated by several hundred miles. The high quality of connection allowed a violin teacher and pupil to play in harmony despite being geographically separated. This quality of connection will be able to reduce limitations placed on students who would be able to study with any tutor regardless of where they lived.

Therefore, as technology improves and advances so shall we witness the fast acceleration of interactive learning in virtual environments. The implication this places on virtual learning environments is immense. It requires so much more organisation and imagination than simply placing text on the Web, perhaps the simplest form of virtual learning environment.

**Wireless technology:** A wireless LAN (or WLAN, for wireless local area network) is one in which a mobile user can connect to a local area network (LAN) through a wireless (radio) connection. The

IEEE 802.11 group of standards specifies the technologies for wireless LANs. 802.11 standards use the Ethernet protocol and CSMA/CA (carrier sense multiple access with collision avoidance) for path sharing and include an encryption method, the Wired Equivalent Privacy algorithm.

Wireless local area networks, as described by Flickerman (2001) could be used to provide access to these virtual learning environments while allowing the learner to choose their own personal learning location. The future of virtual learning environments has many possibilities. If issues of cost and programming were resolved, we could access curriculum using a range of senses.

**PDA:** When accessing a virtual learning environment there may still be a need for students to work together: Web-based learning environments should capitalize on social, communicative, and collaborative dimensions, allowing mediated discourse, they should be portable as far as possible so that they can be used in the proper context, (Hung, 2001).

Future developments in virtual learning environments may embrace portable devices. The benefit of portable devices would mean that students would be able to collaborate and share solutions. Therefore, they can fully act out the learner's roles of apprentice and peer-tutor as described by Hung. Students could also fully utilise a PDA by taking it with them for reference, for example, a student on a biology field trip could use their device to identify an unfamiliar organism.

**Haptic Interfaces:** Haptic is the science of applying tactile sensation to human interaction with computers. A Haptic device is one that involves physical contact between the computer and the user, usually through an input/output device, such as a joystick or data gloves, that senses the body's movements. By using haptic devices, the user can feed information to the computer and at the same time, receive information from the computer in the form of a felt sensation on some part of the body. This is referred to as a haptic interface.

For example, in a virtual reality environment, a user can pick up a virtual tennis ball using a data glove. The computer senses the movement and moves the virtual ball on the display. However, because of the nature of a haptic interface, the user will feel the tennis ball in his hand through

tactile sensations that the computer sends through the data glove, mimicking the feel of the tennis ball in the user's hand.

Haptic technology is already proving to be successful in offline training situations, for example, the training of surgeons. A virtual learning environment, which engages a range of senses, would immerse learners and surely enhance learning. This technology can however make learning situations more accessible to students with special needs, especially those with a visual impairment. Bussell, (2001) describes studies carried out using the Wingman force feedback mouse. This study allowed blind physics students to test electrical charges on an object using the concepts of attract/repel. Other studies have allowed visually impaired students to explore tables of data, represented as bar and line graphs.

The need for specialist hardware seems to be one of the major obstacles to be faced when incorporating haptic technology in a virtual learning environment. Another obstacle is the programming demands placed on Web developers. Immersion's Touch Sense Web Toolkit for JavaScript allows programming, which can be incorporated into Flash movies, a fast growing format for the Web.

In summary haptic technology can benefit the visually impaired and also be used to successfully teach concepts in physics, mathematics and other related subjects. It allows for a more interactive learning experience, which could be potentially implemented across a wide range of subjects. The main obstacles are requirement of specific hardware and demands placed on programmers.

### ***4.3 Summary***

This chapter presented the result of the field works and thereafter interpreted the outcome of the analysis performed on the data obtained from the fieldwork. This interpretation provides a clue for answering this project's research questions. The next chapter will design a virtual classroom and implement its test case, based on the media surveyed and the VLE observed. It will thereafter, discuss a real opportunity as business case for testing the research findings. This test case will focus specifically on the Centre for Research and Continued Engineering Development (CRCED Vaal – Northwest University).

# CHAPTER

## FIVE

### ***5.0 Virtual Mobility Applied***

Now that the concepts of virtual mobility have been discussed, it is necessary to look at its application to my focused area (i.e. the tertiary education). The previous chapter presented the result of the investigations and the discussions on the various findings. Some information were tabulated and the others were presented in graphical form. The outcomes of the investigation were used to answer the research questions. This chapter will however, use the answers to the research questions to design and implement a virtual classroom. After this, I will discuss a business opportunity of virtual learning and conclude the chapter with a summary.

### ***5.1 Virtual Classroom Design***

Although, the educational materials in a virtual classroom may be very similar to that of a traditional classroom, the content will be the same but the form will be electronic. The virtual classroom may not change the content of education but will change the medium and in doing so, will enhance and enrich the learning and communication process.

There are a number of pedagogical methods and models of instruction. These will not be the centre of discussion now. Rather the goals of the virtual classroom focus on the support of a wide range of instructional and classroom activities. Some of the high-level goals of the virtual classroom are, but not limited to the following;

- *To provide a better interactive learning experience than is obtained in the traditional classroom.*
- *To increase learner-to-learner and learner-to-instructor interaction and collaboration.*
- *To provide learners with an integrated learning environment with access to telecommunications and simulations.*

Interactivity to involve the learner actively in the learning process is one primary theme running through these objectives while the other primary theme is to enrich the educational environment.

The virtual classroom is an electronic environment, which supports the many processes of classroom education. Nevertheless, to provide such an environment, the classroom must have some combination of the following elements or more:

### **5.1.1 The Hardware**

There are several piece of hardware required in the design of virtual classroom. These hardware requirements and their corresponding interfacing environments include a combination of the following items (Figure 5.1 shows a typical virtual classroom design);

#### **1. LAPTOP, PC OR PDA**

The instructor will be sitting in front of a computer which will be used to deliver lectures. Lectures will be delivered via a PowerPoint presentation, interactive whiteboard, simulations etc. These could be done from a dedicated virtual classroom or from any remote location.

A virtual classroom provides flexibility for the students to choose where to be, when receiving lectures. The students may sit in front of PCs located in a dedicated virtual classroom and be receiving lectures. They may choose to stay some distance away from the classroom, because, the same content will still be available to them through wireless network or be geographically dispersed and still reach-out to the classroom via a virtual private network (VPN) technology. The basic configuration of the PC and the laptops used by either the instructor or the students (learners) should be as described below

- **PROCESSOR** – Minimum of Pentium III, 500 MHz but 733 MHz recommended
- **MEMORY** – Minimum of 512 MB, but 1 GB recommended
- **HARD DISK** – Minimum of 20 Gigabyte of free space, 40 gigabyte recommended
- **OPERATING SYSTEMS** – Windows 2000 or Windows XP with internet explorer.
- **WIRELESS CARD FOR WLAN<sup>8</sup> STUDENTS** – PCI<sup>9</sup>, USB or inbuilt wireless LAN card.

**2. A MODEM** – This is an acronym for Modulation/Demodulation. This device is required for a computer system to gain access to the internet through an Internet service provider (ISP). Every

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<sup>8</sup> WLAN - an acronym for Wireless Local Area Network

<sup>9</sup> PCI – acronym for Peripheral Components Interconnect.

student that is located outside the coverage area of the campus wireless LAN will only gain access to the classroom through the internet, via the campus's VPN. Hence, a modem will be required in this process.

**3. SERVER** – This will be required to provide storage, sharing and transfer of documents. Similarly, another or the same server called remote access server (RAS or VPN server) will be required to stand as the gateway for the remote users. The server performs two functions; firstly, it checks the students' username and password against the criteria set in its database. Secondly, based on its first function, it will further authenticate and provide access for the user if his credentials match those in its database or deny him access if his credentials are incorrect. In other words, it provides access for the remote user and integrates him with the virtual classroom. The basic configuration of the server(s) should be as described below;

- **PROCESSOR** – Minimum of Pentium 4 or Pentium M, 1.2 GHz and above
- **MEMORY** – Minimum of 512 MB, but 1Gbyte is recommended
- **HARD DISK** – Minimum of 40-Gigabyte of free space, 80-Gigabyte is recommended.
- **OPERATING SYSTEMS** – Windows 2000 Server or Windows 2003 server.
- **OTHER SOFTWARE** – collaboration software
- **MONITOR** - High resolution color, at least 256 colors
- **INPUT DEVICES** - Silent and durable keyboard , mouse and/or touch screen
- **AUDIO/VIDEO/OUTPUT DEVICES** - Directional microphone, Stereo output with earphones switch able to room speakers , If possible, a directional video camera

**5. MULTIMEDIA SYSTEM** - A multimedia system capable of presenting a variety of types of information (e.g., graphics, animation, audio, and video). A video combo with DVD and VHS facility will be a good solution here.

**6. DATA PROJECTOR** - A data projector and its associated whiteboard will be connected to instructor's laptop in a traditional manner. The aim of this is to provide brighter visual aids during the instructor's explanations. For the virtual classroom to be a dedicated classroom, it requires a group focal point as well as personal displays. In the traditional classroom, this has been the blackboard. In the virtual classroom, it is one or more large screen monitors or high-resolution

video projectors. The group display can be used by the instructor for the presentation of information during a lecture or more interestingly, for displaying group results.

**7. ACCESS DEVICES** - A telecommunications system to link the classroom to external educational resources, students or instructors. A wireless access point and outdoor antennae are required to setup a wireless hotspot, which can span through several Kilometers away from the campus. A student within this coverage area can have access to the campus LAN and hence, to the virtual classroom. A Cisco lightweight access point is recommended for this purpose partly because, it support 802.11<sup>10</sup>a/b/g environments. Secondly, it is easy to deploy and lastly, the security it provides through the Cisco structured wireless aware network (SWAN) is unquantifiable.

Similarly, an Internet access will be required to provide access to users outside the coverage area and those that are geographically dispersed away form the campus. A dedicated T1 line from a service provider will be good for this service but an Internet access via college own VSAT<sup>11</sup> equipment is recommended.

### ***5.1.2 The Interfacing & Interconnectivity***

**LOCAL AREA NETWORK:** The computers in the virtual classroom must communicate with each other. This is done through a local area network and one or more servers. The network provides for the transmission of information between the workstations and the server(s). The server is a computer with a large file storage capacity. Generally, for the students to gain access to the server, they must have an account name and a password. If possible, account names should be derivatives of the person's name such as "ihamed" for IDOWU Hamed. (This scheme is not a rule but one of the leading practices in industries).

The network software allows a system administrator to give read/write privileges to the account names. For example, the student may have read/write privileges to his or own directory and read only privileges to a directory containing the instructor's notes. The instructor, on the other hand,

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<sup>10</sup> 802.11 is the IEEE standard for WLAN

<sup>11</sup> VSAT – an acronym for very small aperture terminal. However, it ordinarily refers to the satellite dish used for internet connectivity.

would have read/write privileges to the directory with the notes and may have read/write privileges to all of the student directories. A sampled privilege is tabulated in the table below.

S/N	SPACES	INSTRUCTOR	A STUDENT
1a	PERSONAL (Own )	Read/Write	Read/Write
1b	PERSONAL (Others )	-	-
2	INSTRUCTOR SPACE	Read/Write	-
3a	STUDENT SPACE (own)	Read/Write	Read/write
3b	STUDENT SPACE (others)	Read/Write	-
4	HAND OUT	Read/write	Read only
5	HAND IN	Read/Write	Write only
6	INTERACT SPACE	Read/Write	Read/Write

Table 5.1 - Types of storage areas and corresponding access type

Table 5.1 lists six types of storage areas needed in the virtual classroom. To start, each student as well as the instructor should be assigned a personal space accessible only by that person. The personal space could be used for anything that is not yet meant for others to see. For the instructor it could be notes in preparation, personal files, etc. For the students it could be work in progress, personal notes, etc. The important thing about this space is that it guarantees privacy.

The second space is for the instructor. The instructor space is for storing assignments, exams, notes, grades, feedback, and just about everything about the course that is not public. If there is only one instructor, the instructor space and the instructor's personal space are functionally the same. However, in many courses with different sections taught by different instructors or in courses with several teaching assistants, the instructor space should be accessible by all of the instructors and/or teaching assistants to provide course materials to them.

Student spaces are areas where the instructor and each student can share files. It is a working area for each student containing files of exams, notes, assignments and grades for that student. The instructor can write files to each student space and can read files that each student has

recorded in this area. While the instructor can read and write to all of the student files, each student can read and write to only his or her specific area.

The “Hand out” space is an area that can be used to give students general access to class material. In general, the instructor would write a file to this area and then students would read that file. The “Hand out” space is essentially a one-way channel to the students. The “Hand out” space is used to provide assignments and other information to all students.

The “Hand in” space works in the reverse direction as the “Hand out” space. The students can write to the “Hand in” space but they cannot read or change any existing files that are stored there. When an assignment is complete, it can be written to the “Hand in” space where no one but the instructor can access it.

The “interact” space is an area that is open to everyone. It is used as a free area for passing any information to anyone. There is no network-imposed privacy. Methods of encryption can be used but anyone can overwrite or delete a file. In a non-hostile, friendly environment, as should be the case in education, the “interact” space can be used for interactive group sessions and for collaborative interaction, which will be discussed later.

Since files are stored on a server accessible across the network, students and instructors are not limited to any particular workstation or location. Students may sit in different locations in the classroom on any day. For that matter, if other workstations outside of the classroom are networked to the server, students can access materials outside of the classroom as if they were physically there.

**WIRELESS LOCAL AREA NETWORK:** The function of the wireless LAN is the same as that of the wired LAN as described above. It equally expands the range of wired LAN. The difference between the two is that, wireless connectivity does not require the use of cable or wire. This gives flexibility for users to be mobile and remain connected to the classroom. This advantage of the WLAN is the main reason for adopting it as one of the elements for the implementation of the virtual classroom

**VIRTUAL PRIVATE NETWORK (VPN):** A VPN is a private network that uses a public network (usually the Internet) to connect remote sites or users together. Instead of using a dedicated, real-world connection such as leased line, a VPN uses "virtual" connections routed through the Internet from an organisation's private network to the remote site or employee. VPN connections allow users working at home or on the road to connect in a secure fashion to a remote corporate server using the routing infrastructure provided by a public inter-network (i.e. the Internet). From the user's perspective, the VPN connection is a point-to-point connection between the user's computer and a corporate server.

VPN technology also allows a corporation to connect to branch offices or to other companies over a public inter-network (such as the Internet), while maintaining secure communications. The VPN connection across the Internet logically operates as a wide area network (WAN) link between the sites. In both of these cases, the secure connection across the inter-network appears to the user as a private network communication, despite the fact that this communication occurs over a public inter-network.

One of the most important features of the virtual classroom is not only the network within the classroom but its connection to the outside world. First, the classroom LAN may be connected to the campus network (i.e. the servers and resources on the campus). These may include library resources, information resources and computing resources. Second, the classroom is connected to the world through the Internet, the World Wide Web, and other networks for remote access.

In addition to stored information, the network can bring in on-line guest speakers, interviews with experts, and interactive visits to distant sites. Compressed two-way video can be used to bring in visiting lecturers from other locations.

In Conclusion, the actual design and construction of a virtual classroom is a complicated task. While there are a no off-the-shelf designs as yet, there are a number of prototype classrooms built for experimental purposes. These prototypes have helped to refine the objectives of the classroom and test the hardware solutions for achieving those objectives. Many classrooms was under built, and this revealed the necessary functionality that was lacking. Other classrooms have been

overbuilt revealing hardware options that may be under utilized or never used. Each generation of virtual classroom will hopefully, build on the lessons learned through the previous generation.

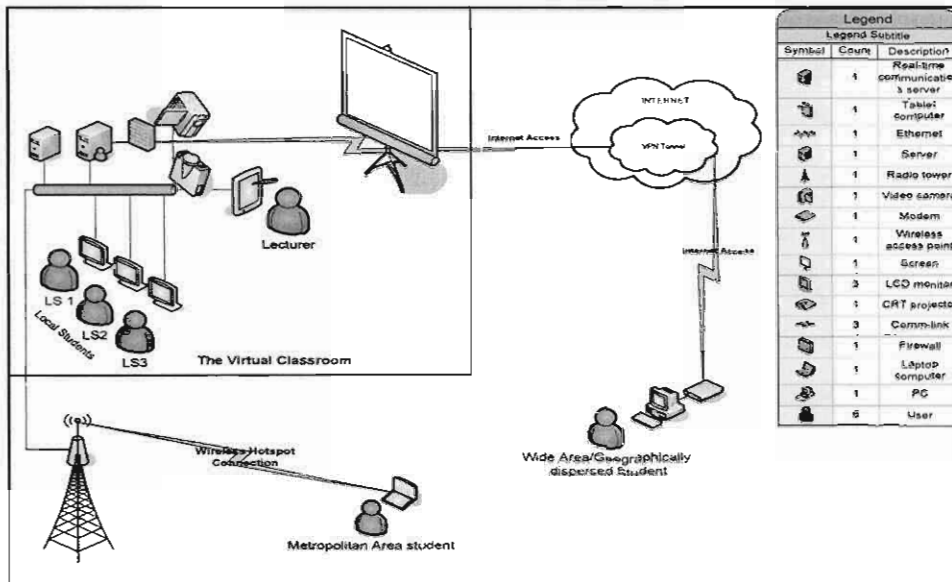


Figure 5.1 – Design of a Virtual Classroom

This section has focused on the physical design and hardware of the virtual classroom. The obvious follow-on question is, "how do we use all of this technology?" The answer to this question comes in two parts. The first part requires a definition of the learning tools. The second requires a mapping of educational processes and these tools into complete learning system. The next section will provide answers to this question

## 5.2 Virtual Classroom implementation

The design of Figure 5.1 above is a generic design of a virtual classroom; this will require a slight modification during implementations for different institutions. However, in the implementation of virtual classroom for the Centre for Research and Continued Engineering Development (CRCED Vaal) of the Northwest University, South Africa, the following description applies;

### 5.2.1 The Hardware Setup

The virtual classroom will be a combination of hardware integrated together with the aid of a local area network (LAN) and associated software (Figure 5.2). A LAN interfacing device for this class is an Ethernet switch, this may be a Cisco catalyst switch configured with network address 10.18.2.0. Connected to this switch is the instructor's computer (with IP address 10.18.2.2), the campus wireless LAN's access point and the Remote access Server (or the VPN Server).

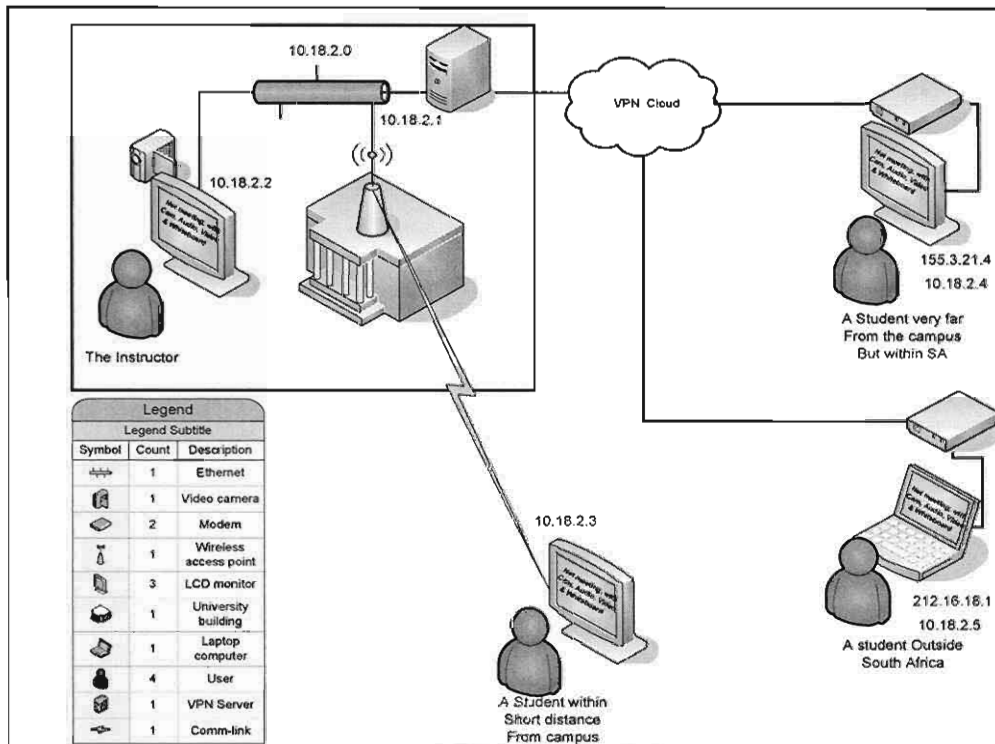


Figure 5.2 - Virtual classroom designed for CRCED

The wireless LAN access point (Cisco lightweight access point), is used to connect remote users who are within the wireless network range to the classroom LAN. This access point was configured with a service set identification (SSID) value, e.g. "CRCEDVClass". SSID is the wireless network name; therefore, wireless clients can connect to the access point only if they are configured with the same SSID as the access point. To enable a secure access to the virtual classroom through wireless LAN, a wireless encryption protocol (WEP) key was configured for both the access point and the wireless client. The WEP key ensures that only authenticated users can have access to

the LAN (or the classroom). After connecting to the wireless LAN, a typical wireless client will obtain the same network address as those used in the virtual classroom LAN (e.g. 10.18.2.3).

S/N	TYPE OF USERS	MEDIUM OF CONNECTION	INITIAL IP ADDRESS	VIRTUAL CLASS IP ADDRESS
1	The Instructor	Ethernet	Default <sup>12</sup>	10.18.2.2
2	Student: within WLAN coverage	Access Point	Default	10.18.2.3
3	Student within SA but outside WLAN coverage	Internet	Internet address <sup>13</sup> (155.3.21.4)	10.18.2.4
4	Students outside SA	Internet	Internet Address (212.16.18.1)	10.18.2.5

Table 5.2 – Users, connection medium and IP address allocation

The remote access server (RAS server) was described in previous section. This server will be installed with 2-network access cards. These cards provide two interfaces for the server. One of these interfaces was configured to be a member of the classroom LAN (e.g. 10.18.2.1). The second network interface was used to connect to Internet via an Internet services provider (ISP). Remote Access service was configured on this server such that, a virtual interface will be established through which clients from remote ends could connect virtually to the classroom's LAN via the internet.

Meanwhile, before connecting to the RAS server, each remote student was allocated user names and passwords. These credentials were the same as those configured in the RAS database by the administrator. The student dials into the RAS server with his username and password, if the credentials supplied are the same as those in the RAS database, the client will be authenticated and be offered access to the LAN. After virtual connection through the internet to the RAS server, a client was allocated an IP address within the range of address in the classroom subnet (e.g. 10.18.2.4). Hence, the student gains the impression of having direct connection to the LAN.

<sup>12</sup> Default : The address on the system prior to connection to the LAN, it is the company built-in address

<sup>13</sup> Internet address is the IP address allocated to users by the service provider when they connect to the internet

In summary, the instructor and all the students developed impressions that they were all connected to the virtual classroom's LAN in the same physical location. This is the greatest achievement of this design. After this connection, the collaboration application was launched and collaboration, discussions and sharing of documents followed. The table above (table 5.2) gives summary of the users' network address allocations and the medium of connection used to access the virtual classroom.

### ***5.2.2 The Collaboration Process***

After setting up the hardware and all parties in the collaboration process connected together, communication was initiated. The form of communication required, is a subject of the type of application chosen for the communication. Research into the various types of collaboration tools and software reflect that, they all have one or more characteristics in common. Some of these characteristics include, establishing the communication link, collaborate, share document, chat and disconnecting the link.

For demonstration purposes, I have chosen to use Microsoft NetMeeting (a real life implementation will make use of Microsoft Communicator 2007<sup>14</sup>); Microsoft NetMeeting features allow you to place calls using directory servers, conferencing servers, and Web pages. NetMeeting makes it easier to place calls over the Internet, organization's intranet, and with telephones. You can work easily with other meeting participants by sharing programs. Only one computer needs to have the program, and all participants can work on the document simultaneously. In addition, people can send and receive files to work on.

NetMeeting's audio and video let you see and hear other people. Even if you are unable to transmit video, you can still receive video calls in the NetMeeting video window. With the Chat feature, you can talk with multiple people. In addition, Chat calls can be encrypted, ensuring that your meetings are private. Using the whiteboard, you can explain concepts by diagramming information, using a sketch, or displaying graphics. You can also copy areas of your desktop or windows and paste them to the whiteboard.

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<sup>14</sup> The Enhanced version of NetMeeting built in Microsoft recent operating systems. Microsoft has since stopped NetMeeting with the release of his Window XP.

### **5.2.3 The Classroom Process**

NetMeeting has both audio and video facilities; therefore the collaborating partners can speak to and view one another. This means, a webcam (or micro-camera) will be required on the users' computer with microphone and speakers installed.

**To host a lecture:** The lecturer or the administrator will perform the following tasks;

1. On the **Call** menu, click **Host Meeting**.
2. In **Meeting Name**, type the meeting name or leave it set to Personal Conference.
3. In **Password**, type the meeting password, and then click **OK** to start the meeting.

Note that the time of your lectures and the password for joining the lectures must be made available to the participant before they can take part in the lectures.

**To join a meeting:** the student will perform the following tasks to join a lecture;

Call the meeting host (**type 10.18.2.2 (under this particular scenario)** in the available space) or any meeting participant. Note that, if you call a meeting participant who is not the host, the call may fail. Therefore, call the meeting host to join the meeting. When you call a participant, you can remain connected as long as the person you called remains connected. When that person leaves or is disconnected from the meeting, you are disconnected also.

**Whiteboard overview:** Whiteboard allows everyone in a meeting to draw and type simultaneously. You can add and delete whiteboard pages, draw shapes, type text, and emphasize an item using the highlighter or the remote pointer. You can copy and paste items between the whiteboard and other programs and from windows and areas of your desktop to the whiteboard. Then, you can use whiteboard's tools to further illustrate the objects. Other meeting participants can see your work without having access to your desktop

Through NetMeeting, the instructor can use the whiteboard to display PowerPoint slides and then explain it to the students in a real time via the audio and video facilities of NetMeeting. Similarly, in a peer-to-peer manner, the students can also discuss with one another by using the chatting facility of NetMeeting. In addition to these, documents can be transferred within all the participants in the

virtual classroom. The processes above are summarily depicted in the flow chart shown in Figure 5.3 below.

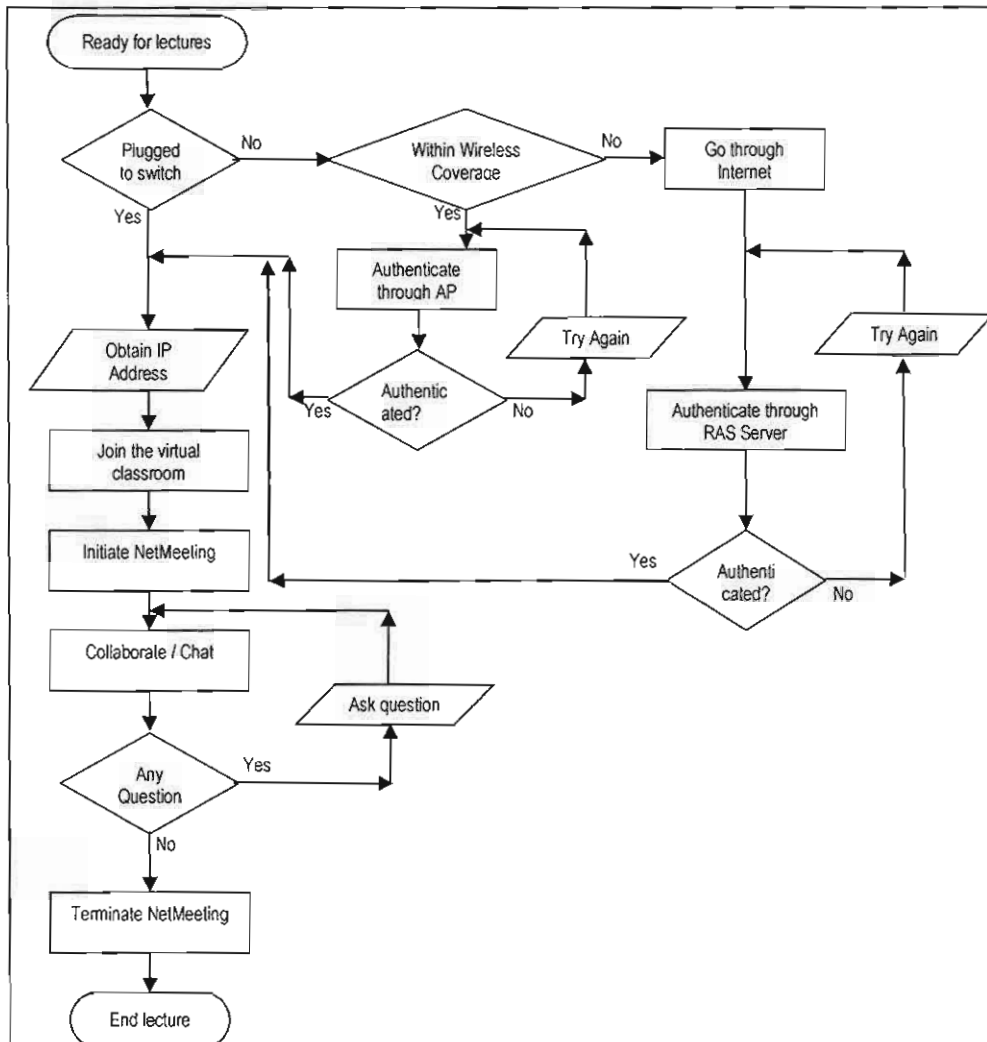


Figure 5.3 – Flowchart showing the Virtual classroom implementation processes

### 5.3 Business Opportunities of Virtual Learning

For every innovative project, there are one or more things to be achieved. These achievements will be spelt out in this project in form of business opportunity that will be gained from the implementation of virtual learning at the CRCED Vaal. CRCED Vaal currently offers courses leading to the awards of Masters of Engineering (M.Eng.) and Doctor of Philosophy (PhD.).

Students that enrolled for these degrees were observed to live in the Vaal area and at most in area around the Johannesburg. The major reason for this is that people living around these area have greater proximity to the college and as such, attending lectures is easy for them compare to other people living in the area surrounding Pretoria, Durban, Cape Town, etc. With the implementation of virtual learning in this college, the geographical barrier will be broken and access will be made available to all people countrywide.

As at the time of writing this dissertation, quite a number of Nigerians were enrolled for a programme at this centre. These students, after graduation, are potential tools and agents for introducing the course and creating awareness about the centre in Nigeria's densely populated academic environment. The number of people seeking further education abroad in Nigeria is so numerous to the extent that an opportunity to obtain foreign qualifications through a virtual means will attract interest.

This explanation is sufficient to conclude that virtual mobility when apply to learning at the CRCED, will bring tremendous achievements, greater income and more prestige to the centre and the University at large. Also, the enrollment will increase from what it is currently. It is therefore recommended to the management of the centre to give the implementation of virtual learning at the centre a priority in its subsequent development plan.

#### ***5.4 Summary***

Figure 5.1 shows a sample schematic of a virtual classroom. The actual hardware and software that delivers the environment may vary, but the key features are workstations for each person, networking among the workstations, classroom display facility, and the servers. The fully integrated virtual classroom will have all of these elements and perhaps more

A design and implementation of the virtual classroom with special focus on the CRCED Vaal was discussed (Figure 5.2). The use of NetMeeting for carrying out the teaching/learning process was explained. Finally, the business opportunities of virtual learning implementations at the CRCED were enumerated. These business opportunities are tremendous and the future expectations are

promising. The next chapter will conclude this project, with summary, constraints and questions for further research.

# CHAPTER

## SIX

### ***6.0 Conclusion and Recommendation***

In the last chapter, I designed a typical virtual classroom and discussed the requirements for its implementation. This was done with special focus on the CRCED Vaal of the Northwest University. A typical prototype of virtual classroom was discussed as a test case for the implementation of this work. A careful selection of tools (the hardware, software and the networking interfaces) were used for this exhibition. This chapter will raise the main conclusion derived from this research and discuss some of the constraints faced by the project and the author during the course of this work. I will make some suggestion for further research and finalise the chapter with summary.

### ***6.1 Conclusions***

Virtual mobility as it stands today has many areas where its application will be beneficial to everyone and probably reduce the cost of traveling. In applying virtual mobility to learning, we realised that there is the possibility that virtual classroom will some day replace traditional classroom just as e-mail replaced the traditional mailing system (postal system). However, one fundamental fact remains: This replacement cannot be total, because of the willingness to socialise in real physical realm. This is analogous to the reason why e-mail systems cannot completely eradicate the postal mailing system. Because some items such as bags, cloths etc cannot be mailed to the destination via e-mail. Hence, we conclude that virtual mobility will only substitute traditional classroom and not completely replace it.

The main advantage of virtual learning is the globalisation involved in its implementation, as people are no more geographically restricted to a particular area for learning to take place. Both the lecturers and the learners have the choice of choosing where to be during teaching and learning. This freedom reduces the boredom attached to people who have to leave relatives, friends and family at home for places nearer to the campus.

The difficulty posed to learning by technology is enormous because, double learning process has to be embarked upon by both the instructor and the learners. The instructors will have to be trained firstly, on how to use the technology, secondly, on how to use the technology in teaching context and lastly, on how to deliver the teaching context with the use of technology. Similarly, the learners will have to learn how to use the learning tools for him to be able to achieve the best from his learning.

Nevertheless, the rapid improvement and innovations in technology requires that all the users be adequately supported. Support service has to be made very close to users of the technology so that their learning experience will be enjoyable. The cost of implementation and upgrading technology is another factor that requires critical attention. As good as it sounds, if the cost of implementation is too much for all the parties involved (the institution owners, the instructors and the learners), the best of virtual teaching and learning will not be achieved.

To cap it all, it is my opining that traditional learning will stay for as long as people live in the geographical space, because this space is the natural home of human beings. The social interactions embarked upon in this space are in-built into human psychology. The virtual reality brought about by the social interaction in a virtual space (though have produced better achievements and results) cannot eliminate the physical socialisation of the people.

Hence, virtual learning may not totally replace traditional learning but can supplement or complement it. Secondly, we can only replace traditional classroom with virtual classroom for some selected courses. Thirdly, the technological barriers can be overcome by training and making support services available for the end users. Fourthly, any mobility project should take into consideration future developments in their implementations such that their project will not be obsolete before its inauguration.

Having concluded that virtual classroom can be used as a substitute for traditional classroom, a virtual classroom could be designed without sophisticated software and hardware. NetMeeting is a good application for delivering lectures in a virtual classroom. A switch, a lightweight access point,

and a server with internet access plus the necessary peripherals can actually be setup for running a virtual classroom.

## ***6.2 Constraints***

"A 100 miles journey begins with a single step". Such a statement is common in an effort towards achieving a goal. My intention with this project was to address a number of the issues surrounding the application of virtual mobility to learning. However, due to time and cost, a scope was defined to limit efforts to a subset of the problem so that some other people can continue from where I stopped. Despite the scope, the project and the author suffered serious setbacks during the course of this work. Hence, the main purpose of this section is to discuss some noticeable constraints encountered during this work.

As a foreign student in another country with different people, culture and environment, I really struggled against some natural phenomenon before completing this task. South Africa's weather, most especially during the winter made work difficult for me to do; I either did little or no work at all during this period trying to acclimatise with various sicknesses.

Similarly, I did not know places, but I needed to meet people who assist in filling-out my questionnaire and be interviewed. This is a challenging task, because a chain of friends was needed to know the right people to be approached. Knowing the right people also required meeting them at places, which a stranger like me did not know. All these challenges are notable and will remain in my memory as long as I live.

Most significant and unforgettable problem was encountered during the interview. People are not willing to spare their time for the interview to be conducted. During the interview however, I got the meaning of the proverb that says, "one man's food is another man's poison". Many of the interviewees (as a South African attitude) for example, wanted me to look straight into their faces during our interactions: This habit is regarded as a sign of disrespect in my culture. At least I tried to cope!

The cost of going round places for investigations in both Nigeria and South Africa constitute a constraint. Materials have to be found on the Internet, library and some organisations' archive. All these processes incurred great deal of expenses. The problems become compounded due to the uneasy access to the required materials because the topic is very new and little works have been done so far on this topic.

The major problem encountered during this work, was the unavailability of a "ready-made" facility to test the VPN connection (and subsequently my virtual classroom design), the cost of setting up all the required equipments for this experiment was unbearable to the author. To look for sponsorship will take a lot of time beyond necessary, because a project of this nature will cost tens of thousands of Rand.

In order to test the design, I had to rely on my past experience (as a Cisco Certified Wireless LAN Specialist), where I have actually put up a VPN across the Internet in a real life situation. A wireless LAN at the "Koster van Herdeen Hostel, Sasolburg" was used in carrying out the test. This WLAN comprises of up to 100 users laptops and PCs. This wireless network was used in place of the Internet and the test was carried out successfully. This success indicated that the design would work for any network, even on a larger platform like the Internet.

A combination of these constraints affected the details that may not be available in this work; however, that does not rule out the fact that careful consideration and adequate steps have been taken to make sure that this work has the required quality. Some other works that still need to be done on this topic will be suggested in the following section.

### ***6.3 Further research questions***

Because there was no "off-the-shelf" software or tool for virtual learning, a combination of technological tools were used by various researchers. Some of these are still been improved upon. In order for this work to reach the standard level required of it, it will be suggested that anyone who chooses to study this work further should concentrate on the design of a web application that makes use of all the chosen tools. This web application will then enclose all the various

applications and software with additional insight developed from this research into a single application that will be easy to use and be users friendly.

Other suggestion for further research are but not limited to the following;

- How can we integrate the various virtual classrooms into virtual university in a single VLE?
- How can the conventional curriculum be made applicable to virtual learning?
- What are the financial benefits of achieving social growth through virtual means over physical means? (A comparative cost analysis of traditional classroom and virtual classroom)
- How can we develop a VLE that will be sensitive to the different cultural values and learning style?
- What model can be considered a good style for virtual learning?

The conclusion in this work is similar to other research done on related topics in the past. However, future researchers should investigate additional factors. Three approaches seem appropriate for such research. The first is to compliment the conducted study with more expert interviews. Secondly, the future respondents could have more international experience as well as experience in different ICT equipment and their various applications. Thirdly, approach can be in-depth case studies, which can be used to enhance the framework. In particular, comparative case studies of different learning models and VLE applications will be helpful.

## **6.4 Summary**

From the beginning of this work (chapter 1), we introduced the concept of virtual mobility and explained the rational behind my research for its application in tertiary education. The research questions were also stated. The concepts of virtual mobility and the various work done on similar projects were summarised, this is tagged literature survey (chapter 2). Questionnaires were designed and interviews were conducted to seek the opinion of the people on various issues surrounding this topic (chapter 3).

I presented the result and discussed the outcome of the various analyses performed on the results of the investigation. The outcomes were used to answer the research questions (chapter 4). The various answers to the research questions gave an insight into how to design and implement a

virtual classroom, taken into consideration the various tools and support requirements of the users. A prototype classroom was exhibited and tested in real life (chapter 5).Chapter 6 conclude the work with the major conclusions (derived from the research), explanation of the various constraints faced while doing the project and suggestions for further research were listed.

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# APPENDIX I

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## Virtual Mobility in Tertiary Education Survey Learner's questionnaire

This is a questionnaire to ask you what you think about virtual learning and technology in education. Definitions can be found at the end of this questionnaire. I also use the terms 'information and communications technology' (ICT) as catch-all terms to refer to your use of computers, Internet and other related technologies.

### INSTRUCTIONS FOR COMPLETION

Where there is a space to write, please write neatly in BLOCK CAPITALS. Please mark the box like this  against the option, which represents your answer.

Name of college .....

### SECTION 1: ABOUT YOU

**Q 1 What sort of student are you?** (Please mark the main one only)

Full time  Part-time  Distance Learner  Leisure student

**Q 2 In which of these subject areas are your courses?** (Mark any boxes that apply, ask your teachers if you are not sure)

Sciences and mathematics	<input type="checkbox"/>	Sports, leisure and travel	<input type="checkbox"/>
Construction	<input type="checkbox"/>	Hairdressing and beauty therapy	<input type="checkbox"/>
Engineering, Technology & manufacturing	<input type="checkbox"/>	Social care and public services	<input type="checkbox"/>
Business administration, management	<input type="checkbox"/>	Visual and performing arts and media	<input type="checkbox"/>
professional ICT	<input type="checkbox"/>	Humanities	<input type="checkbox"/>
Retailing, customer service	<input type="checkbox"/>	Languages and communication	<input type="checkbox"/>
Transportation	<input type="checkbox"/>	Leisure student (short-term evening classes, not for qualification)	<input type="checkbox"/>
Hospitality	<input type="checkbox"/>		

**Q 3 what level is your course?** (Ask your teachers if you're not sure)

Ordinary National Diploma (OND)	<input type="checkbox"/>	Masters Degree (M.Sc., M.Tech etc)	<input type="checkbox"/>
Higher National Diploma (HND)	<input type="checkbox"/>	Doctoral Degree (PhD.)	<input type="checkbox"/>
University Diploma	<input type="checkbox"/>	Certificates	<input type="checkbox"/>
Bachelor's Degree (B.Sc., B.Ed, etc)	<input type="checkbox"/>	Other (please specify)	

**Q 4 How long have you been at college?** (Years, if less than a year put NA here).....

More than 5 years	<input type="checkbox"/>	3 years	<input type="checkbox"/>
5 years	<input type="checkbox"/>	2 Years	<input type="checkbox"/>
4 years	<input type="checkbox"/>	1 Year	<input type="checkbox"/>

**SECTION 2: TECHNOLOGY USAGE**

**Q 5 How often does your teacher use these as part of your learning:** (1- Always, 2-daily, 3-Weekly, 4-Monthly, 5-Never)

Tools	1	2	3	4	5		1	2	3	4	5
PowerPoint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Video conferencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Interactive Whiteboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	TV/VCR/DVD	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Data projector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	CD ROMs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Class notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discussion boards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Networked PCs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Email for assessment feedback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internet websites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Peripherals (cameras etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
College websites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mobile Devices (PDAs etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Audio Conference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						

**Q 6 How useful have you found the following applications of technology as part of your learning?** (1 – Very Useful, 2- Useful, 3 – Averagely useful, 4 – Not Useful, 5 – Can't say)

Response	1	2	3	4	5
PowerPoint presentations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using MS Office (Word, Excel, Access etc) applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using Internet to find information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessing information from CD/DVDs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Accessing the Intranet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Downloading lecture notes and messages from Intranet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using message boards and chat rooms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Using self-assessment tests	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Taking online tests and quizzes with instant electronic feedback	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Submitting work via email	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Following web links provided for extra information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tracking your own progress on the VLE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q 7 As a learner, how do you usually work with fellow students on your course and/or share ideas with them?** (Mark those, which apply):

Face to face	<input type="checkbox"/>	Email	<input type="checkbox"/>	Chat room	<input type="checkbox"/>
Telephone	<input type="checkbox"/>	Teleconference	<input type="checkbox"/>	Discussion lists	<input type="checkbox"/>

**SECTION 3: SUPPORT**

**Q 8 How are you helped to use technology in the classroom?** (Mark those, which apply)

Face-to-face	<input type="checkbox"/>	Dedicated courses	<input type="checkbox"/>	Dedicated help desk	<input type="checkbox"/>
Email During lessons	<input type="checkbox"/>	In own time	<input type="checkbox"/>		

**Q 9 How are you helped to use technology in the learning centre?** (Mark those, which apply)

Face-to-face	<input type="checkbox"/>	During lessons	<input type="checkbox"/>	In own time	<input type="checkbox"/>
Email	<input type="checkbox"/>	Dedicated courses	<input type="checkbox"/>	Dedicated help desk	<input type="checkbox"/>

**Q 10 How do you rate the technical support you receive in the college?**

Very poor	<input type="checkbox"/>	Average	<input type="checkbox"/>	Very good	<input type="checkbox"/>
Poor	<input type="checkbox"/>	Good	<input type="checkbox"/>		

**SECTION 4: RESOURCES**

**Q 11** Are there enough open access PCs in the college for you to use in completing course work? (Yes/No) .....

**Q 12** Are they accessible at times that are useful to you? (Yes/ No) .....

**Q 13** Do you use a computer at home or in your workplace for studying?

No (Please go to Section 5)

Yes, but have no Internet access (Please go to Section 5)

Yes, with a dial-up modem Internet connection

Yes, with a broadband Internet connection

**Q 14** Do you access materials through the VLE (such as lecture notes, announcements, tests and quizzes) from home or your workplace as well as at college? (Yes/No).....  
If No please go to Section 5

**Q 15** If you do study at home or in the workplace, how much do you agree with the following statements (1-Strongly disagree, 2 – Disagree, 3 – Agree, 4 – Strongly agree, 5 – No Idea)

Response	1	2	3	4	5
More able to learn at own pace than in class	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Able to work at times suited to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Can repeat difficult bits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Allows more time for reflection	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prefer working in groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Like to have teacher to help me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Like to have, things explained in sequence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q 16** In general, at home or in the workplace, do you find you have problems with....(mark those which apply)

Time/space       Connecting to the Internet       Cost of printing

**SECTION 5: CONTENT**

**Q 17** Thinking about the VLE content of the course that you access independently through the internet (at college, home, or work) compared to other content (e.g. text books, TV and video), how much do you agree or disagree that ... (1-Strongly disagree, 2 – Disagree, 3 – Agree, 4 – Strongly agree, 5 – No Idea)

Response	1	2	3	4	5
It is more fun and flexible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is user friendly	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is visually more stimulating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I learn faster and remember more	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is easy to use and follow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is more practical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
It is more reflective, it helps me learn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I can do the work in my own time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



interactive. It might be known as a college intranet or by the trade names: Blackboard; WebCT; Lotus Learning Space; Learnwise; Fretwell Downing LE; Top Class; First Class; Pioneer; Solstra; Doodle; CISCO System. Some colleges may have an in-house system. As part of the survey, we need to collect personal information to ensure that everyone's views are represented, and to ensure equality of opportunity.

**Thank you very much for completing this questionnaire**

## APPENDIX II

### Virtual Mobility in Tertiary Education Survey

#### Teaching & Supporting Staff's questionnaire

This is a questionnaire to ask you what you think about virtual learning and technology in education. Definitions can be found at the end of this questionnaire. We also use the terms 'information and communications technology' (ICT) as catch-all terms to refer to your use of computers, Internet and other related technologies.

#### INSTRUCTIONS FOR COMPLETION

Where there is a space to write, please write neatly in BLOCK CAPITALS. Please mark the box like this X against the option, which represents your answer.

Name of college .....

#### SECTION 1 : ABOUT YOU

##### Q 1 Type of staff member.

Are you predominantly involved in:

Teaching  Administration (clerical/secretarial)   
Support work (technician/ librarian)  Management

Q 2 How long have you been in your current type of work? ( .....years, if less than a year put naught)

Q 3 How long have you worked at this college? ( .....years, if less than a year put naught)

Q 4 Are you involved specifically with adult learners some of the time (Yes/No) ? .....

Q 5 Are you involved with distance learning courses some of the time (Yes/No) ? .....

#### SECTION 2: TECHNOLOGY USAGE AND YOU

Q 1 Please provide us with an honest assessment of how enthusiastic you feel about using computers and other related technologies in your workplace

	Not Enthusiastic	1	2	3	4	5	Very Enthusiastic
a) ICT/technology generally		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b) ICT/technology in teaching and learning		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

In these areas of admin/record keeping:

**Q 2 How often do you currently use ICT/technology in...:** Never 1 2 3 4 5 Constantly

- a) Communicating with colleagues
- b) Assessment
- c) Marking
- d) Record keeping/ registration
- e) Tracking learner progress

**Q 3 How valuable is ICT/technology in...**

Not at all 1 2 3 4 5 Essential

- a) Communicating with colleagues
- b) Assessment
- c) Marking
- d) Record keeping/ registration
- e) Tracking learner progress

In these areas of teaching and learning work:

**Q 4 How often do you currently use ICT/technology in...**

- a) Classroom teaching
- b) Workshops/learning centres
- c) Feedback/communication with learners
- d) Distance/online learning
- e) Your office/desk at college

**Q 5 How valuable is ICT/technology in...**

Not Valuable

1 2 3 4 5 Very Valuable

- a) Classroom teaching
- b) Workshops/learning centres
- c) Feedback/communication with learners
- d) Distance/online learning
- e) Your office/desk at college

**Q 6 To what extent has the new learning technology changed the way you work over the last 5 years? (please mark one)**

Not at all  A little  Quite a lot  Completely

### SECTION 3: TECHNOLOGY SUPPORT

**Q 1 How satisfied are you with the IT support offered in relation to the following:**

Very dissatisfied 1 2 3 4 5 Very satisfied

- a) Use of the intranet/VLE
- b) Hardware
- c) Software
- d) Staff development & training for ILT
- e) Teaching materials

How many courses have you attended in the last year which were designed to...

Q 2 improve your technology skills?

Q 3 help you use technology in your work?

.....

.....

How satisfied were you with the courses that were designed to...

Very satisfied 1 2 3 4 5 Very satisfied

Q 4 improve your technology skills?

Q 5 help you use technology in your work?

Q 6 How well prepared do you feel to deliver and support learning with ICT/technology?

Not at all

Prepared

Very prepared

Q 7 What are the types of support that you may likely need? (Please mark all that apply)

Help with basic IT problems

Using specific learning software

Help with network problems

Teaching materials training courses

Help in using the VLE

PowerPoint presentation

Other (Please specify).....

Q 8 How useful would you find the following types of additional support?

Not at all useful 1 2 3 4 5 Essential

a) General help with technology

b) Subject specific help to apply technology in your area

c) Courses offered for technology skills development

d) Courses on how to develop teaching with technology

e) Provision of a repository of materials to use in your own time

f) Help in accessing Web-based learning materials

Q 9 Please indicate how in your view the role of support staff has changed in relation to the use of Information and Learning Technology?

a) Support staff have become more important in the college

b) Support staff are now called upon more by teaching staff

c) Support staff are now called upon more by learners

d) Support staff are now called upon more by management

e) Support staff are called upon to help in more subject areas than before

f) Teaching staff technology skills are higher now

g) Teaching staff require more sophisticated support

h) Learners' technology skills are higher now

i) Learners require more sophisticated support

j) More of the support offered relates to equipment

k) More of the support offered relates to software

l) More of the support offered relates to the VLE/Intranet

m) More of the support offered is now directed at distance learners

n) Please add any other ways in which you think the support role has changed.....

.....  
.....

## SECTION 4: CONTENT: CURRICULUM AND LEARNING MATERIALS & RESOURCES

**Q 1 How often do you use the following methods and equipment for delivering learning and teaching in your classroom or learning centre?**

	Never	1	2	3	4	5	Always
a) PowerPoint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Interactive whiteboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Video conferencing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Data projector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Stand-alone PCs for some students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Networked PCs for some students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Stand-alone PCs for each student	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Networked PCs for each student	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) One PC for staff or student use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Peripherals (cameras etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k) Mobile devices (PDAs etc)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q 2 Would you be more likely to use technology in the classroom if there were:**

a) More training for teaching staff in general ICT skills	<input type="checkbox"/>
b) More training for teaching staff in using ICT in teaching and learning	<input type="checkbox"/>
c) Good practice & models of how to use ICT in teaching and learning	<input type="checkbox"/>
d) More and better technology equipment	<input type="checkbox"/>
e) Every teacher has a personal PC in the classroom	<input type="checkbox"/>
f) Specially configured rooms for teaching with computers	<input type="checkbox"/>
g) More e-learning/VLE content	<input type="checkbox"/>
h) More institutional support	<input type="checkbox"/>
i) More departmental support	<input type="checkbox"/>

**Q 3 How often do you use the college VLE/intranet on the courses that you teach...**

	Never	1	2	3	4	5	Always
a) To post lecture notes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) For tracking an individual student's progress	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) For posting tests and quizzes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) As a notice board	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) As a chatroom for discussion with/between students	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) To Email feedback to learners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q 4 Are any of the courses you teach available as distance learning?**

Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
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**Q 5 If Yes, roughly what proportion of your work involves delivering distance learning?**

0-20%	<input type="checkbox"/>	41-60%	<input type="checkbox"/>		
21-40%	<input type="checkbox"/>	61-80%	<input type="checkbox"/>	81-100%	<input type="checkbox"/>

Clearly, the use of ICT is not appropriate for all learning occasions. However, this question relates to times when you consider ICT would be useful in the classroom or learning centre.

**Q 6 How often do you find the following factors prevent greater use of e-learning/ILT in the classroom or learning centre?**

	Never	1	2	3	4	5	All the time
a) Unreliable network	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Insufficient equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Ill-equipped rooms (e.g. lack of network points)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Poor software/ learning materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Lack of electronic course content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Time to prepare materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Lack of Support & guidance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Lack of Personal Confidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l) Resistnace to change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) Lack of student ICT skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k) student reluctance to use the materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**SECTION 6: OUTCOMES**

**Q 1 In your view, how much impact does the use of technology in teaching and learning have on the following outcomes?**

	None	1	2	3	4	5	A great deal
a) Improved attendance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Improved retention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) More enjoyable learning experience	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Making students more motivated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Higher overall grades	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Making students more employable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Better record keeping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h) Easier management of courses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Q 2 To what extent do you think students' learning outcomes have improved because of the application of technology so far?** Not at all      great deal

**Q 3 To what extent do you think learning outcomes will improve in the future because of the application of technology?** Not at all      great deal

**Q 4 In what ways could technology have even more impact in the future?** *(Please continue on another sheet if necessary)*

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**SECTION 7: PERSONAL PROFILE**

As part of the survey we need to collect personal information to ensure that everyone's views are represented and to ensure equality of opportunity. All answers are anonymous and confidential.

**Q 1 Gender. - Are you:** Female  Male

**Q 2 How old are you?** 16-24  25-34  35-44   
45-54  55+

**DEFINITIONS:**

**ILT:** Information and learning technology (the standard term used by the LSC and within the National Learning Network) refers to the use of information and communications technologies to support the core business of colleges: the delivery and management of learning.

**E-learning:** By e-Learning we mean electronic learning technologies e.g. data projectors, interactive whiteboards, VLE and the teaching/learning methods that they enable. If someone is learning in a way that uses information and communication technologies (ICT) (computers, other equipment and software) they are doing e-learning. Classroom technology use might involve: all students sitting in front of networked PCs while the teacher guides your learning; data projectors from his computer, video-conferencing, using web cams, watching demonstrations using technology, etc.

**VLE:** A virtual learning environment is defined as: 'the components in which learners and tutors participate in "on-line" interactions of various kinds, including on-line learning. VLEs can come in various formats including such brands as: Blackboard; WebCT; Lotus Learning Space; Learnwise; Fretwell Downing LE; Top Class; First Class; Pioneer; Solstra; Doodle; CISCO System. Some colleges may have an in-house system.

**Thank you for your time and co-operation in completing this questionnaire.**

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## APPENDIX III

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### INTERVIEW

#### (Concerning Meetings, Travel and Virtual Media)

**About the INTERVIEW:** This questionnaire is part of a project whose aim is to:

- ✓ Develop and support the implementation of realistic strategies with the view to replace traditional campus with virtual campus.
- ✓ Develop new services that can strengthen the use of virtual mobility in tertiary education
- ✓ Identify and manage barriers, which could hinder the use of virtual mobility in education.

Your answer will help me to better understand experiences and opinions surrounding traveling to campus and virtual meetings with the tutors that exist plus to understand the factors that influence the choice of meeting media. After many of the questions, there is room for your comments. Thank you for your participation.

**About yourself:** In the section below, follow the questions concerning your role at the institution. Kindly choose the best Alternative that corresponds to your circumstances.

1. **What city is your office located in?** .....
2. **Which division do you work in?** .....
3. **What is your job title?** .....
4. **Have you participated in any work projects in which the participants are located in another location?**
  - a) Yes
  - b) No

#### About meetings, travel and virtual media

**About Meetings:** In the section below, follow the questions concerning meetings. Kindly choose the best alternative that corresponds to your circumstances. PLEASE ALSO NOTE THAT WE ONLY CONSIDER MEETINGS IN WHICH ONE OF THE PARTICIPANTS IS SITUATED IN ANOTHER LOCATION.

5. **How large a share of your meetings (approximately), physical or virtual is with your institution's top management?**
  - a) None at all
  - b) Less than 30%
  - c) Between 30% and 60%
  - d) More than 60%Comments:

**6. How large a share of your meetings (approximately), physical or virtual, is with external company Personnel?**

- a) None at all
- b) Less than 30%
- c) Between 30% and 60%
- d) More than 60%

Comments:

**7. Is there any type of meeting; in general, that you think should be held using virtual media?**

- a). Non
- b). Yes, Name it .....

**8. Is there any type of meeting; in general, which you think requires physical presence?**

- a). Non
- b). Yes, Name it .....

**9. Have you traveled to meetings that, in your opinion, might as well could have been held by virtual means?**

- a) Never
- b) Less than 6 times/yr
- c) Less than 12 times/yr
- d) 12 times or more

**About Travel:** In the following section a number of statements regarding travel are presented. Please choose the alternative that you consider to be most correct. Please also note that only business travel is considered (excluding commuting to and from work).

**10. Travel to a location other than the one I work at is part of my job.**

- a) Yes
- b) No (proceed to the next section, question 19)

**11. I travel an average of:**

- a) 1-2 times per year
- b) 3-5 times per year
- c) 6-10 times per year
- d) 11-20 times per year
- e) More than 20 times per year

If you have stated that you travel more than 20 times per year, please specify.

**12. The most common purposes for my travel are:**

- a) Project meeting or another work-related meeting
- b) Customer contact, marketing
- c) Education and/or Conference
- d) Network Meeting

**About Virtual Meeting:** In the concept of Virtual Meetings we include all forms of meetings in which information and communication technology are used for communicating in real-time.

**13. I have received instructions about the infrastructure (hard and software) that is available at my Workplace to support Virtual Meetings (e.g. meeting rooms with conference telephones, videoconferencing equipment, NetMeeting, etc).**

- a) Fully agree
- b) Partly agree
- c) Do not agree
- d) Don't know/undecided

Comments:

**14. I have received information about how to use the virtual media at my workplace**

- a) Fully agree
- b) Partly agree
- c) Do not agree
- d) Don't know/undecided

Comments:

**About Audio conferencing:** Please note that when we refer to audio conferencing, we consider meeting with three or more participants, in which at least one participates via telephone.

**15. I participate in audio conferencing at work.**

- a) Yes
- b) No

**16. I participate in audio conferencing on average:**

- a) 1-6 times per year
- b) 7-12 times per year
- c) 2-5 times per month
- d) 6-10 times per month
- e) More than 10 times per month

If you stated more than 10 times per month, please specify.

**17. It has happened that I get irritated during an audio conferencing session due to other participants lack of meeting skills.**

- a) Never
- b) Sometimes
- c) Often

Comments:

**18. I feel just as comfortable during an audio conference as I do during a physical meeting.**

- a) Fully agree
- b) Partly agree

- c) Don't agree
- d) Don't know/undecided

**About Net meeting:** In this section there are a number of statements regarding 'NetMeeting'. Please select the alternative that you consider most correct.

**19. I participate in Virtual Meetings in which we use Microsoft NetMeeting as a compliment.**

- a) Yes
- b) No

**20. I participate in meetings in which NetMeeting is used on average:**

- a) 1-6 times per year
  - b) 7-12 times per year
  - c) 2-5 times per month
  - d) 6-10 times per month
  - e) More than 10 times per month
- If you stated more than 10 times per month, please specify.

**21. I feel confident with using all the functions in NetMeeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**22. I can, without technical assistance lead a NetMeeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**23. My impression is that most of my colleagues know how to use NetMeeting**

- a) Fully agree
  - b) Partly agree
  - c) Don't agree
  - d) Don't know/undecided
- Comments:

**24. It has happened that I get irritated during a NetMeeting session due to connection problems or other technically related problems.**

- a) Fully agree
  - b) Partly agree
  - c) Don't agree
  - d) Don't know/undecided
- Comments:

**25. It has happened that I get irritated during a NetMeeting session because other participants are uncertain of how to use the software functions**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**26. I have used the video function of NetMeeting**

- a) Never
- b) Yes, I have tried it out
- c) Yes, regularly

**About Videoconferencing:** In this section there are a number of statements regarding videoconferencing.

Please select the alternative that you consider most correct.

**27. I have access to videoconferencing equipment at my workplace**

- a) Yes
- b) No

Comments:

**28. I participate in videoconferences in my job**

- a) Yes
- b) No (proceed to the next section, question 47)

Comments:

**29. I participate in videoconferences on average:**

- a) 1-6 times per year
- b) 7-12 times per year
- c) 2-5 times per month
- d) 6-10 times per month
- e) More than 10 times per month

If you stated more than 10 times per month, please specify.

**30. I think the video equipment at my workplace is viable and works satisfactorily**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**31. I know how the videoconferencing equipment works and can manage to start a videoconference on my own**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**32. I know whom to contact if I need assistance in handling the equipment or other technical Problems during a videoconference.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**33. I know how the support technology (document camera, digital projector, etc.) in the Videoconferencing facilities functions.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**34. I think that the booking system for the videoconferencing studio (s) I use works well.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**35. It has happened that I am irritated during a videoconference due to other participants having bad videoconferencing skills.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**36. I feel just as bothered during a videoconference as I do during a physical meeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**37. If I could rely on that the videoconferencing facility I use worked without delays or technical problems, I would use it to replace more physical meetings than today.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**38. If the currently available videoconferencing facilities were upgraded with better sound and picture quality and more support functions (e.g. electronic whiteboard), I would replace more physical meetings than today.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**About your opinion:** In the following section, a number of questions and statements concerning your own opinion and preferences are presented. Please select the alternative that you consider most correct.

**39. Lack of time is a serious problem in my work**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**40. My work does not provide time for me to further my studies**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**41. If an online education (or virtual learning) is available, I will prefer to enroll so that I can further my studies at home or at work place**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

Comments:

**42. If you have the choice to select any of the following tools for virtual learning, which one do think will result in a satisfactory complement/substitute to the traditional classroom?**

- a) Teleconference
- b) Netmeeting with whiteboard
- c) Messenger service (chat)
- d) Audioconference
- e) E-Mail

Comments:

**43. How often do you use your choice in question 42 above?**

- a) Always

- b) Once in a week
- c) Few days in a month
- d) By chance

**Thanks for your participation. The results of the survey will be published soon.**

**SIGNATURE: .....**

**DATE: .....**

# APPENDIX IV

## INTERVIEW

### (Concerning Tools (Media) for Meetings and Collaboration)

**About the INTERVIEW:** This questionnaire is part of a project whose aim is to:

- ✓ Develop and support the implementation of realistic strategies with the view to replace traditional campus with Virtual campus.
- ✓ Develop new services that can strengthen the use of virtual mobility in tertiary education
- ✓ Identify and manage barriers, which could hinder the use of virtual mobility in education.

Your answer will help us to better understand experiences and opinions surrounding traveling to campus and Virtual Meetings with the tutors that exist plus to understand the factors that influence the choice of meeting media. After many of the questions, there is room for your comments. Thank you for your participation.

**About yourself:** In the section below, follow the questions concerning your role at the institution. Kindly choose the best Alternative that corresponds to your circumstances.

1. **What city is your office located in?** .....
2. **What is your job title?** .....
3. **Have you participated in any work projects in which the participants are located in another location? (Yes / No)**

#### About meetings, travel and virtual media

**About Meetings:** In the section below, follow the questions concerning meetings. Kindly choose the best alternative that corresponds to your circumstances. PLEASE ALSO NOTE THAT WE ONLY CONSIDER MEETINGS IN WHICH ONE OF THE PARTICIPANTS IS SITUATED IN ANOTHER LOCATION.

**4. Is there any type of meeting; in general, which you think should be held using virtual media?**

- a). Non
- b). Yes, Name it .....

**5. Is there any type of meeting; in general, which you think requires physical presence?**

- a). Non
- b). Yes, Name it .....

**6. Have you traveled to meetings that, in your opinion, might as well could have been held by virtual means?**

- a) Never
- b) Less than 6 times/yr
- c) Less than 12 times/yr
- d) 12 times or more

**About Virtual Meeting:** In the concept of Virtual Meetings we include all forms of meetings in which information and communication technologies are used for communicating in real-time.

**7. I have received instructions about the infrastructure (hard and software) that is available at my Workplace to support Virtual Meetings (e.g. meeting rooms with conference telephones, videoconferencing equipment, NetMeeting, etc).**

- a) Fully agree
- b) Partly agree
- c) Do not agree
- d) Don't know/undecided

**8. I have received information about how to use the virtual media at my workplace**

- a) Fully agree
- b) Partly agree
- c) Do not agree
- d) Don't know/undecided

**About Audioconferencing:** Please note that when we refer to audioconferencing, we consider meeting with three or more participants, in which at least one participates via telephone.

**9. I participate in audioconferencing at work. (Yes / No). If No proceed to question 13**

**10. I participate in audioconferencing on average:**

- a) Everyday
- b) Once in a Week
- c) Once in a Month
- d) Once in a year

**11. It has happened that I get irritated during an audio conferencing session due to other participants lack of meeting skills.**

- a) Never
- b) Sometimes
- c) Often

**12. I feel just as comfortable during an audioconference as I do during a physical meeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**About NetMeeting:** In this section there a number of statements regarding 'NetMeeting'. Please select the alternative that you consider most correct.

**13. I participate in Virtual Meetings in which we use Microsoft NetMeeting as a compliment. (Yes/No). If No proceed to Question 19**

**14. I participate in meetings in which NetMeeting is used on average:**

- a) Everyday
- b) Once in a week
- c) Once in a Month
- d) Once in a Year

**15. I feel confident with using all the functions in NetMeeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**16. I can, without technical assistance lead a NetMeeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**17. It has happened that I get irritated during a NetMeeting session due to connection problems or other technically related problems.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**18. I have used the video function of NetMeeting**

- a) Never
- b) Yes, I have tried it out
- c) Yes, regularly

**About Videoconferencing:** In this section there are a number of statements regarding videoconferencing. Please select the alternative that you consider most correct.

**19. I have access to videoconferencing equipment at my workplace (Yes / No)**

**20. I participate in videoconferences in my job (Yes/No).** If No proceed to Question 29

**21. I participate in videoconferences on average:**

- a) Everyday
- b) Once in a week
- c) Once in a Month
- d) Once in a Year

**22. I know how the videoconferencing equipment works and can manage to start a videoconference on my own**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**23. I know whom to contact if I need assistance in handling the equipment or other technical Problems during a videoconference.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**24. I know how the support technology (document camera, digital projector, etc.) in the Videoconferencing facilities functions.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**25. It has happened that I am irritated during a videoconference due to other participants having bad videoconferencing skills.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**26. I feel just as bothered during a videoconference as I do during a physical meeting.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**27. If I could rely on that the videoconferencing facility I use worked without delays or technical Problems, I would use it to replace more physical meetings than today.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**28. If the currently available videoconferencing facilities were upgraded with better sound and Picture quality and more support functions (e.g. electronic whiteboard), I would replace more Physical meetings than today.**

- a) Fully agree
- b) Partly agree
- c) Don't agree
- d) Don't know/undecided

**About your opinion:** In the following section, a number of questions and statements concerning your own opinion and preferences are presented. Please select the alternative that you consider most correct.

**29. Lack of time is a serious problem in my work**

- a) Fully agree
  - b) Partly agree
  - c) Don't agree
  - d) Don't know/undecided
- Comments:

**30. My work does not provide time for me to further my studies**

- a) Fully agree
  - b) Partly agree
  - c) Don't agree
  - d) Don't know/undecided
- Comments:

**31. If an online education (or virtual learning) is available, I will prefer to enroll so that I can further my studies at home or at work place**

- a) Fully agree
  - b) Partly agree
  - c) Don't agree
  - d) Don't know/undecided
- Comments:

**32. If you have the choice to select any of the following tools for virtual learning, which one do think will result in a satisfactory complement/substitute to the traditional classroom?**

- a) Teleconference
- b) Net meeting with whiteboard

- c) Messenger service (chat)
  - d) E-Mail
- Comments:

**Thanks for your participation. The results of the survey will be published soon.**

**SIGNATURE: .....**

**DATE: .....**

# APPENDIX V

VIRTUAL MOBILITY IN TERTIARY EDUCATION															
AUTHOR : IDOWU Hamed Ademayowa															
Questionnaire's Response Tabulation, Calculation and Analysis															
	TEACHING/SUPPORT STAFF						LEARNERS								
	0	1	2	3	4	5 Total	0	1	2	3	4	5 Total			
<b>1 Technology Usage</b>							<b>Use of Technology</b>								
1 Enthusiasm	0	9	6	3	3	21	47	0	42	51	33	12	12	152	
2 For Communication	0	5	11	7	11	12	47	0	61	47	15	19	10	152	
3 For assessment	0	13	1	8	17	8	47	0	58	36	23	22	6	152	
4 For Marking	0	11	4	4	13	10	47	0	46	18	39	28	21	152	
5 For Record Keeping	0	8	7	9	13	10	47	0	61	45	17	13	16	152	
6 Tracking Progress	0	9	15	3	14	6	47	0	11	49	25	38	29	152	
7 Classroom teaching & Learning	0	1	5	10	12	19	47	0	19	38	42	2	51	152	
8 Distance Learning	0	10	7	16	9	5	47	0	29	39	24	27	42	152	
9 Feedback	0	7	11	9	12	8	47	0	38	31	27	21	35	152	
<b>2 Support Obtained On Technology Usage</b>							<b>Means of support</b>								
1 Hardware	0	1	2	9	21	14	47	21	34	31	23	32	37	152	
2 Software	0	4	7	15	13	6	47	47	51	21	25	26	32	202	
3 Development and Training on ICT usage	0	11	0	1	23	12	47		npoor			VG			
4 On Teaching and Learning Materials	0	6	11	16	7	5	47	0	1	2	9	4	5		
5 Use of the VLE/intranet	2	6	13	6	9	7	47		Support Rating	0	16	32	37	42	23
<b>3 Support Required On Technology Usage</b>															
1 Help with BASIC IT problems	2	5	3	19	10	8	47								
2 Help with Network problem	2	15	10	9	4	7	47								
3 Help in using the VLE	0	10	8	13	11	5	47								
4 Help in using specific Learning Software	0	2	5	20	16	2	47								
5 Power Point Presentation	1	7	13	12	8	6	47								
<b>4 ICT Resources and Contents</b>							<b>Resources &amp; Contents</b>								
1 Availability of ICT resources	0	1	6	17	12	9	47	16	51	73		152			
2 Accessibility to PC and other tools	0	6	17	23	1	0	47	25	59	68		152			
3 Usage of PC and Other tools	0	11	7	8	18	3	47	xxxxxxxxxxxxxxxxxxxxxxxx No Dialup BB							
4 Accessibility through the VLE	1	9	5	13	10	9	47	57	53		32	152			
5 Accessibility through the intranet	0	6	4	12	8	17	47	xxxxxxxxxxxxxxxxxxxxxxxx Time Connectn Cost							
6 Accessibility through the internet	0	7	4	6	13	15	47	26	82		44	152			
	No Idea						No Idea								
<b>5 Impact &amp; Learning Outcomes</b>							<b>Impact &amp; Learning Outcome</b>								
1 Allow more learning	0	1	2	3	4	5	Total	0	1	2	3	4	5	Total	
2 Allow better grades								8	12	31	35	43	24	152	
3 makes students get better jobs	0	2	12	7	16	10	47	4	26	27	41	35	19	152	
4 improve attendance	0	13	8	5	11	10	47	1	27	32	53	32	10	152	
5 Improves retention	0	13	11	4	7	12	47	2	29	41	17	25	38	152	
6 More Enjoyable learning Experience	0	3	0	19	2	23	47								
7 Motivates students	0	8	6	9	13	11	47								
8 Higher Overall grades	0	6	12	19	5	5	47								
9 Better records Keeping	0	3	12	15	6	11	47								
10 Easy Record Tracking	0	5	2	9	14	17	47								
<b>6 Technological Teaching/Learning Contents</b>															
	always					Never									
1 Powerpoint Presentations	0	9	11	9	8	10	47	0	47	13	17	21	53	152	
2 Interactive white boards	0	19	5	2	6	15	47	0	29	31	25	21	47	152	
3 Video Conference	0	1	3	2	14	27	47	0	22	16	13	6	55	152	
4 Data Projector	0	13	3	8	6	17	47	0	59	13	13	19	51	152	
5 Stand alone PC	0	22	12	6	5	0	47	0	76	42	21	3	8	152	
6 Networked PC	0	15	13	6	2	8	47	0	34	26	14	28	56	152	
7 Peripherals	0	7	14	6	7	11	47	0	29	17	31	24	51	152	
8 Mobile Devices	0	5	5	0	7	26	47	0	15	26	29	33	49	152	
9 Class Notes	0	17	12	4	3	6	47	0	72	10	32	17	21	152	
10 Discussion Board	0	8	15	9	7	6	47	0	36	31	27	21	35	152	
11 E-mail	0	14	11	10	7	5	47	0	54	42	32	12	8	152	
12 Audio Conferences	0	1	3	2	13	28	47	0	19	20	11	8	57	152	
13 Internet Websites	0	4	29	27	19	35	152	0	45	29	27	19	35	152	
14 College Websites	0	0	30	31	28	21	42	0	30	31	28	21	42		
<b>7 Barriers of ICT applications In Learning</b>															
1 Unreliable Network	0	12	6	7	19	3	47								
2 Insufficient Equipment	0	5	5	5	22	8	47								
3 Ill equipped Room (e.g. lack of Network points)	0	5	2	9	14	16	47								
4 Poor Software/ Learning Materials	0	15	11	9	4	7	47								
5 Lack of Electronics Course Content	0	4	3	1	15	24	47								
6 Time to prepare materials	0	5	2	10	16	13	47								
7 Lack of Support and Guidance	0	7	14	6	7	11	47								
8 Lack of Personal Confidence	0	13	11	4	7	12	47								
9 Resistance to Change	0	6	9	11	4	7	47								
10 Lack of Students ICT skills	0	15	11	7	4	9	47								
11 Students reluctance to use the Materials	0	9	16	9	14	6	47								

# APPENDIX VI

Virtual Mobility in Tertiary Education

VIRTUAL MOBILITY IN TERTIARY EDUCATION							
AUTHOR :- IDOWU Hamed Ademayowa							
Questionnaire's Response Tabulation now represented as percentages							
TEACHING/SUPPORT STAFF							
1	<b>Technology Usage</b>	<b>No Idea</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometime:</b>	<b>Often</b>	<b>Constantly Total</b>
	1 Enthusiasm	0.00%	19.15%	12.77%	6.38%	17.02%	44.68% 100.00%
	2 For Communication	0.00%	12.77%	23.40%	14.89%	23.40%	25.53% 100.00%
	3 For assessment	0.00%	27.66%	2.13%	17.02%	36.17%	17.02% 100.00%
	4 For Marking	0.00%	23.40%	8.51%	8.51%	38.30%	21.28% 100.00%
	5 For Record Keeping	0.00%	17.02%	14.89%	19.15%	27.66%	21.28% 100.00%
	6 Tracking Progress	0.00%	19.15%	31.91%	6.38%	29.79%	12.77% 100.00%
	7 Classroom teaching & Learning	0.00%	2.13%	10.64%	21.28%	25.53%	40.43% 100.00%
	8 Distance Learning	0.00%	21.28%	14.89%	34.04%	19.15%	10.64% 100.00%
	9 Feedback	0.00%	14.89%	23.40%	19.15%	25.53%	17.02% 100.00%
2	<b>Support Obtained On Technology Usage</b>	<b>Very Disatisfy</b>	<b>Disatisfy</b>	<b>Average</b>	<b>Satisfy</b>	<b>Very Satis:</b>	<b>Total</b>
	1 Hardware	0.00%	2.13%	4.26%	19.15%	44.68%	29.79% 100.00%
	2 Software	0.00%	8.51%	14.89%	31.91%	27.66%	17.02% 100.00%
	3 Development and Training on ICT usage	0.00%	23.40%	0.00%	2.13%	48.94%	25.53% 100.00%
	4 On Teaching and Learning Materials	0.00%	12.77%	23.40%	38.30%	14.89%	10.64% 100.00%
	5 Use of the VLE/Intranet	4.26%	17.02%	27.66%	17.02%	19.15%	14.89% 100.00%
3	<b>Support Required On Technology Usage</b>	<b>Not at All</b>	<b>Not Essen</b>	<b>Rarely Ess</b>	<b>Fairly esse</b>	<b>Essential</b>	<b>V-Essentia Total</b>
	1 Help with Basic IT problems	4.26%	10.64%	6.38%	40.43%	21.28%	17.02% 100.00%
	2 Help with Network problem	4.26%	31.91%	21.28%	19.15%	8.51%	14.89% 100.00%
	3 Help in using the VLE	0.00%	21.28%	17.02%	27.66%	23.40%	10.64% 100.00%
	4 Help in using specific Learning Software	0.00%	4.26%	10.64%	42.55%	38.30%	4.26% 100.00%
	5 Power Point Presentation	2.13%	14.89%	27.66%	25.53%	17.02%	12.77% 100.00%
4	<b>ICT Resources and Contents</b>	<b>No Idea</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometime:</b>	<b>Often</b>	<b>Always Total</b>
	1 Availability of ICT resources	0.00%	2.13%	12.77%	36.17%	29.79%	19.15% 100.00%
	2 Accessibility to PC and other tools	0.00%	12.77%	36.17%	48.94%	2.13%	0.00% 100.00%
	3 Usage of PC and Other tools	0.00%	23.40%	14.89%	17.02%	38.30%	8.39% 100.00%
	4 Accessibility through the VLE	2.13%	19.15%	10.64%	27.66%	21.28%	19.15% 100.00%
	5 Accessibility through the Intranet	0.00%	12.77%	8.51%	25.53%	17.02%	36.17% 100.00%
	6 Accessibility through the Internet	0.00%	14.89%	8.51%	17.02%	27.66%	31.91% 100.00%

Virtual Mobility in Tertiary Education

5	<b>Impact &amp; Learning Outcomes</b>	<b>No Idea</b>	<b>Not at all</b>	<b>Little</b>	<b>Average</b>	<b>Better</b>	<b>Great deal</b>	<b>Total</b>
	1 Allow more learning							
	2 Allow better grades							
	3 makes students get better jobs	0.00%	4.26%	25.53%	14.89%	34.04%	21.28%	100.00%
	4 Improve attendance	0.00%	27.66%	17.02%	10.64%	23.40%	21.28%	100.00%
	5 Improves retention	0.00%	27.66%	23.40%	8.51%	14.89%	25.53%	100.00%
	6 More Enjoyable learning Experience	0.00%	6.38%	0.00%	40.43%	4.26%	48.94%	100.00%
	7 Motivates students	0.00%	17.02%	12.77%	19.15%	27.66%	23.40%	100.00%
	8 Higher Overall grades	0.00%	12.77%	25.53%	40.43%	10.64%	10.64%	100.00%
	9 Better records Keeping	0.00%	6.38%	25.53%	31.91%	12.77%	23.40%	100.00%
	10 Easy Record Tracking	0.00%	10.64%	4.26%	19.15%	29.79%	36.17%	100.00%
6	<b>Technological Teaching/Learning Contents</b>	<b>No Idea</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometime</b>	<b>Often</b>	<b>Always</b>	<b>Total</b>
	1 Powerpoint Presentations	0.00%	19.15%	23.40%	19.15%	17.02%	21.28%	100.00%
	2 Interactive white boards	0.00%	40.43%	10.64%	4.26%	12.77%	31.91%	100.00%
	3 Video Conference	0.00%	2.13%	6.38%	4.26%	29.79%	57.45%	100.00%
	4 Data Projector	0.00%	27.66%	6.38%	17.02%	12.77%	36.17%	100.00%
	5 Stand alone PC	0.00%	46.81%	25.53%	17.02%	10.64%	0.00%	100.00%
	6 Networked PC	0.00%	34.04%	27.66%	17.02%	4.26%	17.02%	100.00%
	7 Peripherals	0.00%	14.89%	29.79%	17.02%	14.89%	23.40%	100.00%
	8 Mobile Devices	0.00%	10.64%	19.15%	0.00%	14.89%	55.32%	100.00%
	9 Class Notes	0.00%	36.17%	25.53%	8.51%	17.02%	12.77%	100.00%
	10 Discussion Board	0.00%	17.02%	31.91%	19.15%	14.89%	17.02%	100.00%
	11 E-Mail	0.00%	29.79%	23.40%	21.28%	14.89%	10.64%	100.00%
	12 Audio Conferences	0.00%	2.13%	6.38%	4.26%	27.66%	59.57%	100.00%
	13 Internet Websites							
14 College Websites								
7	<b>Barriers of ICT applications in Learning</b>	<b>No Idea</b>	<b>Never</b>	<b>Rarely</b>	<b>Sometime</b>	<b>Often</b>	<b>Always</b>	<b>Total</b>
	1 Unreliable Network	0.00%	25.53%	12.77%	14.89%	40.43%	6.39%	100.00%
	2 Insufficient Equipment	0.00%	10.64%	10.64%	10.64%	51.06%	17.02%	100.00%
	3 Ill equipped Room (e.g lack of Network po	0.00%	12.77%	4.26%	19.15%	29.79%	34.04%	100.00%
	4 Poor Software/ Learning Materials	0.00%	34.04%	23.40%	19.15%	8.51%	14.89%	100.00%
	5 Lack of Electronics Course Content	0.00%	8.51%	6.38%	2.13%	31.91%	51.06%	100.00%
	6 Time to prepare materials	0.00%	12.77%	4.26%	21.28%	34.04%	27.66%	100.00%
	7 Lack of Support and Guidance	0.00%	14.89%	29.79%	17.02%	14.89%	23.40%	100.00%
	8 Lack of Personal Confidence	0.00%	27.66%	23.40%	8.51%	14.89%	25.53%	100.00%
	9 Resistance to Change	0.00%	12.77%	19.15%	23.40%	8.51%	36.17%	100.00%
	10 Lack of Students ICT skills	0.00%	34.04%	23.40%	14.89%	8.51%	19.15%	100.00%
11 Students reluctance to use the Materials	0.00%	17.02%	21.28%	19.15%	29.79%	12.77%	100.00%	

Virtual Mobility in Tertiary Education

VIRTUAL MOBILITY IN TERTIARY EDUCATION										
AUTHOR :- IDOWU Hamed Ademayowa										
Questionnaire's Response Tabulation now represented as percentages										
LEARNERS										
1	<b>Technology Usage</b>	<b>Use of Technology</b>	<b>No Idea</b>	<b>V- Useful</b>	<b>Useful</b>	<b>Average</b>	<b>Not Useful</b>	<b>Can't say</b>	<b>Total</b>	
	1 Enthusiasm	Microsoft Office	0.00%	27.83%	33.55%	21.71%	9.21%	7.89%	100.00%	
	2 For Communication	CD/DVD	0.00%	40.13%	30.92%	9.87%	12.50%	6.58%	100.00%	
	3 For assessment	Internet	0.00%	38.16%	23.68%	18.42%	14.47%	5.26%	100.00%	
	4 For Marking	Intranet	0.00%	30.26%	11.84%	25.68%	18.42%	13.82%	100.00%	
	5 For Record Keeping	E-mail	0.00%	40.13%	28.61%	11.18%	8.55%	10.53%	100.00%	
	6 Tracking Progress	Self assessment test	0.00%	7.24%	32.24%	18.45%	25.00%	16.08%	100.00%	
	7 Classroom teaching & Learning	Online tests	0.00%	12.50%	25.00%	27.03%	1.32%	33.55%	100.00%	
	8 Distance Learning	Tracking own progres	0.00%	13.16%	25.68%	15.79%	17.78%	27.83%	100.00%	
	9 Feedback	Chatroom	0.00%	25.00%	20.38%	17.78%	13.82%	23.03%	100.00%	
2	<b>Support Obtained On Technology Usage</b>	<b>Means of Support</b>	<b>Face2Face</b>	<b>E-Mail</b>	<b>Help Desk</b>	<b>Telephone</b>	<b>Ded Class</b>	<b>Own time</b>	<b>Total</b>	
	1 Hardware	Help in the classroom	20.71%	17.17%	15.65%	11.62%	18.18%	18.89%	100.00%	
	2 Software	Help in the learning C	23.27%	25.25%	10.40%	12.38%	12.87%	15.84%	100.00%	
	3 Development and Training on ICT usage									
	4 On Teaching and Learning Materials									
	5 Use of the VLE/Intranet	Support Rating	No Idea	Very poor	Poor	Average	Good	Very Good	Total	
			0.00%	11.84%	21.05%	24.34%	27.63%	15.13%	100.00%	
3	<b>Support Required On Technology Usage</b>									
	1 Help with Basic IT problems									
	2 Help with Network problem									
	3 Help in using the VLE									
	4 Help in using specific Learning Software									
	5 Power Point Presentation									
4	<b>ICT Resources and Contents</b>	<b>Resources &amp; Contents</b>	<b>NA</b>	<b>No</b>	<b>Yes</b>	<b>Total</b>				
	1 Availability of ICT resources		11.84%	40.13%	48.03%	100.00%				
	2 Accessibility to PC and other tools		16.45%	38.82%	44.74%	100.00%				
	3 Usage of PC and Other tools	xxxxxxxxxxxxxxxx No		Dialup	Broadband					
	4 Accessibility through the VLE	Internet Access	37.50%	41.45%	21.05%	100.00%				
	5 Accessibility through the Intranet	xxxxxxxxxxxxxxxx Time/Space		Connectn	Printing cost					
	6 Accessibility through the Internet	problems	17.11%	53.95%	28.95%	100.00%				
5	<b>Impact &amp; Learning Outcomes</b>	<b>Impact &amp; Learning Outcomes</b>	<b>No Idea</b>	<b>Not at all</b>	<b>Little</b>	<b>Average</b>	<b>Better</b>	<b>Great deal</b>	<b>Total</b>	
	1 Allow more learning		3.95%	7.89%	20.39%	23.68%	25.25%	15.79%	100.00%	
	2 Allow better grades		2.83%	17.17%	17.78%	28.67%	23.03%	12.50%	100.00%	
	3 makes students get better jobs		0.68%	17.78%	21.05%	32.24%	21.05%	8.58%	100.00%	
	4 Improve attendance	No Effect	1.32%	19.08%	28.67%	11.18%	18.45%	25.00%	100.00%	
	5 Improves retention									
	6 More Enjoyable learning Experience									
	7 Motivates students									
	8 Higher Overall grades									
	9 Better records Keeping									
	10 Easy Record Tracking									
6	<b>Technological Teaching/Learning Contents</b>		<b>No Idea</b>	<b>Always</b>	<b>Often</b>	<b>Sometimes</b>	<b>Rarely</b>	<b>Never</b>	<b>Total</b>	
	1 Powerpoint Presentations		0.00%	30.92%	8.55%	11.18%	13.82%	35.53%	100.00%	
	2 Interactive white boards		0.00%	18.42%	20.39%	18.45%	13.82%	30.92%	100.00%	
	3 Video Conference		0.00%	14.47%	10.53%	8.55%	3.95%	62.50%	100.00%	
	4 Data Projector		0.00%	38.82%	8.55%	6.58%	12.50%	33.55%	100.00%	
	5 Stand alone PC		0.00%	51.32%	27.03%	13.82%	1.97%	5.26%	100.00%	
	6 Networked PC		0.00%	22.37%	13.16%	9.21%	18.42%	36.94%	100.00%	
	7 Peripherals		0.00%	19.08%	11.18%	20.39%	15.79%	33.55%	100.00%	
	8 Mobiles Devices		0.00%	10.53%	17.11%	18.42%	21.71%	32.24%	100.00%	
	9 Class Notes		0.00%	47.37%	6.58%	21.05%	11.18%	13.82%	100.00%	
	10 Discussion Board		0.00%	25.00%	20.39%	17.78%	13.82%	23.03%	100.00%	
	11 E-Mail		0.00%	38.16%	27.63%	21.05%	7.89%	5.26%	100.00%	
	12 Audio Conferences		0.00%	12.50%	13.16%	7.24%	3.29%	63.82%	100.00%	
	13 Internet Websites		0.00%	26.67%	18.08%	17.78%	12.50%	23.86%	100.00%	
	14 College Websites		0.00%	19.74%	20.39%	18.42%	13.82%	27.83%	100.00%	

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## **LIST OF ACRONYMS**

<b><u>ACRONYMS</u></b>	<b><u>MEANING</u></b>
AP	Access Point
CD	Compact Disk
CRCED	Centre for Research and Continuous Engineering Development
DVD	Digital Video Disk
EVU	Erasmus Virtual University
HCM	Human Capital and Mobility
HE/HIS	Meant to represent both gender
ICT	Information and Communications Technology
ILT	Information and Learning Technology
ISP	Internet Service Provider
LAN	Local Area Network
LL2	Learners Learn 2gether
ODL	Open and Distance Learning
P2P	Peer-to-Peer
PC	Personal Computer
PDA	Personal Digital Assistance
PTS	Personal Transferable Skills
ROM	Read Only Memory
SSID	Service Set Identification
VHS	Video Home System
VirtUE	Virtual University for Europe
VM	Virtual Mobility
VMDL	Virtual Mobility and Distributed Learning
VPN	Virtual Private Network
VSAT	Very Small Aperture Terminal
VSM	Virtual Students' Mobility
WEP	Wireless Encryption Protocols
WLAN	Wireless Local Area Network