Application of Blended Learning in Imparting Software Skills and Measuring Student Satisfaction

By

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(MSC/ ADC / 2002 / 15)

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DECLARATION

I hereby certify that this dissertation entitled **"Application of Blended Learning in Imparting Software Skills and Measuring Student Satisfaction"** does not incorporate without acknowledgement any material previously submitted for a degree, diploma in any University and to the best of my knowledge and belief, it does not contain any materials previoisly published or written by another person or myself, except where due reference is made in the text. I also hereby give consent for my dissertation if accepted to be made available for photocopying and for inter library loans, and for the title and summary to be made available to outside organisations.

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ABSTRACT

Education - It is the supreme art of the teacher to
awaken joy in creative expression and knowledge.

- Albert Einstein (1879–1955) -

The Global Village concept has emerged with key references to education. Higher education programmes worldwide attracts increasing number of students progressively. In the case of Government universities in Sri Lanka, it is a fact that higher education at present accommodates only less than 10% of the total student population vying for entry. In Sri Lankan Universities many courses accommodate, large groups of students, and now it has come to light that there can be a negative impact on the quality of education. Blended learning approaches have been planned and introduced to improve this situation healthily.

This research focuses on the process of developing a learning environment that facilitates imparting application software skills to large student groups using a blended learning approach. The selected learning environment is a Computer laboratory complex of a Government University in Sri Lanka. The Student feedback obtained via a survey using a sample of 300 students reveals that the students overall perception at virtual lecturer session at a distance computer laboratory is at a satisfactory level, even though it is less than of the live lecturer session. The factors which affect the overall student satisfaction in the selected environment are revealed to be visibility of demonstration, audibility of Lecturer and non existence of technical difficulties. The research concludes by providing an insight into the limitations of the developed environment, and indicates the parameters for further research directions emerging out of this research.

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ABBREVIATIONS

1. ADBI - Asian Development Bank Institute
2. AICC - Aviation Industry CBT (Computer Based Training) Committee
3. CAI - Computer Assisted Instruction
4. CBT - Computer Based Training
5. CCD - Charged Couple Device
6. CMI - Computer Managed Instruction
7. CMS - Course Management System, Content Management System
8. FMSC - Faculty of Management Studies & Commerce, University of Sri Jayewardenepura.
9. ILS - Integrated Learning Systems
10. IMI - Interactive Multimedia Instruction
11. ITRC - Information Technology Resource Centre, University of Sri Jayewardenepura.
12. LCMS - Learning Content Management System
13. LMS - Learning Management System
14. LVC - Live Virtual Classroom
15. SCORM - Sharable Content Object Reference Model
16. SME - Subject Matter Expert
17. TBL - Technology Based Learning
18. TEL - Technology Enhanced Learning
19. UCSC - University of Colombo School of Computing
20. WBT - Web Based Training
21. WCMS - Web Content Management Systems

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CHAPTER ONE - INTRODUCTION

"If you tell me, I will listen,
If you show me, I will see.
If you let me experience, I will learn."
- Lao Tzu, 6th Century B.C.

1.1. Overview

Learning is the foundation which has lead to growth of civilizations, and the statement above is a reflection of that fact. The Webster's dictionary refers to the term as "the act or experience of one that learns; knowledge of skill acquired by instruction or study; modification of a behavioural tendency by experience."

In the Global perspective, the Education sector reflects continuous growth irrespective of outlying factors such as economic conditions, and social problems. Statistics from the United Kingdom (Times Higher, 2006) and Sri Lanka (UGC, 2006) reveal that higher education sector reflects this growth behaviour pattern.

In Sri Lanka, 2.9% of GDP is used on Education, with 17.25% of total spending on Education (0.5% of GDP) utilised for Higher Education. The main beneficiary of this funding is the 15 Government Universities. (UGC, 2006) However this percentage is barely sufficient to accommodate the higher education necessities of a developing country like Sri Lanka. 58% of candidates are eligible to enter universities, but only 14% of them secure admission. (UGC, 2006). Higher Education Institutes are compelled to work out alternate solutions to accommodate the progressively increasing student intakes.

In keeping to global trends, introduction to new degree programs is a need of the hour. Creating new degree programs and increasing the student population does bring forward several other issues to settle. Evidence from Australian Universities suggests that in practice the number of students a catalystic skilled teacher in the learning process will handle (per lecturer students ratio) has increased to 20 students (AVCC, 2005). Evidence from Sri Lanka suggests that the students per lecturer ratio is at 20, although

there is a disparity among displinces. (IRQUE, 2007). Planners of new courses are unable to keep up to such standards at present due to numerous criteria.

In analysing the undergraduate intake to Sri Lankan Universities, the University of Sri Jayewardenepura is the Second Largest (UGC, 2007). The Faculty of Management Studies & Commerce (FMSC) of this University is the largest of the five faculties, and absorbs over 850 students per Academic Year.. The FMSC was established in 1972, with two academic departments. At present (September 2007) the faculty consists of ten (10) Departments, comprising one hundred and sixty nine (169) academic staff members and a total student population of over four thousand (4,000) undergraduate and 575 postgraduate level students. The FMSC restructuring programme activated in 2001 resulted in the formation of ten (10) departments. These departments offer courses/services in their respective areas of specialization for various degree programs administered by the faculty. (Ref. Appendix A). During the first two years, a student follows a common programme of study, followed by two years of specialised study. (Ref. Appendix B).

The FMSC possesses its own Computer Centre, which has been in operation since December 2000. Initially named as the Computer Centre, it has subsequently been renamed as the Information Technology Resource Centre (ITRC). The ITRC's capacity of 90 computers (In 2002) was meagrely insufficient to cater to it's existing undergraduate population of over Four Thousand. This is in spite of the centre being fully operational for 7 days of the week, from 7.30 am to 8.30 pm daily.

Every student entering the FMSC had to be imparted a skills training on the use of Application Software packages during their first year programme. Depending on their chosen field of study, they are also provided necessary skills to master application software used in the specific field of study. In the training sessions, a subject expert (Lecturer) demonstrates the use of the software packages using a Multimedia Projector and Audio Visual equipment. The students could follow the instructions, and the lecturer would generally not visit the students individually, but additional instructors, were made available to assist the students. This methodology of teaching could be extended, but when the session participants reached a figure close to one hundred, the physical dimensions of the classroom environment makes it impossible for all students to have a clear view of the lecturer, as well as the projection screen. Furthermore it makes it

difficult for the lecturer to monitor individual student performances - if and when necessary.

Most specialised degree programs at the FMSC cater to One Hundred students or more generally. We consider this figure to be a large group, and in such situations alternatives must be planned. Limiting the class size inevitably results that the lecturer had to either repeat the class at a separate time, or consider the services of an additional lecturer with a similar teaching ability and subject matter expertise. In certain situations both of the options explained cannot be considered as viable – due to the hiring cost, availability of the lecturer, and the scarcity of qualified lecturers. This was especially valid when considering Software Packages which were used in specialised domains viz Sage® Accounting Range, AutoCAD® , Arcview® GIS, and Microsoft® Project.

In the year 2003 the FMSC surmounted a backlog of 850 students. The usual practice to accommodate such a student backlog is to merge them with a regular intake, and such a special intake is usually referred to as a "double batch". The physical resources of the FMSC and University in general were only geared to accommodate this 2003 backlog after the exit of the double batch intake of 2001, whose exit was scheduled for 2005. There were a numerous unresolved issues, which had to be ironed out prior to the absorption of the double batch. Solving the availability of IT resources was a crisis situation for the University Administration.

The FMSC will be faced with another dilemma in the future, once and when the double batch will be taken in – to manage the Internship programme. Most of the degree programmes of the FMSC had a Internship / Practical Training component in the final year of study. In order to manage the double batch of students, and to provide them with the necessary academic support facilities, a viable solution should be planned. The necessity for evolving of technological solutions was born out to overcome the problems discussed in the paragraph. The objective and the scope is listed out for comprehension.

1.2. The Objective and the Scope

The Primary objective was to design and develop an IT enabled learning environment at the IT Resource centre in order to ensure imparting software skills.

The Secondary objective was to ascertain student satisfaction level in the Blended Learning environment, and Identifying factors affecting their satisfaction.

Expected features of the proposed environment:

- The solution had to look at the Infrastructure (Hardware & especially Software) aspects, Human Resource Requirements, and Procedural changes required to integrate the solution to the students.
- Beneficial in handling large numbers of students, especially for a double batch at a future date.
- It was meant to be learner centric, and to improve the academic support facilities provided to students.
- The system once, successfully implemented internally should be extendable to assist students in the 3rd & 4th years who are on internship to connect up with the academic programmes. (When the pending double batch reached their 3rd year).
- The proposed technology interface solution needed to be cost effective, as technological solutions invariably involves significant financial commitments.

The more direct method of assessing the effectiveness of the implemented system would be to measure the skills imparted to students using the environment. However, a formative or summative assessment of skills was not included into the scope of the research. Thus a decision was made to explore existing e-learning research efforts in order to visualise the proposed IT enabled Learning Environment.

1.3. Research Plan

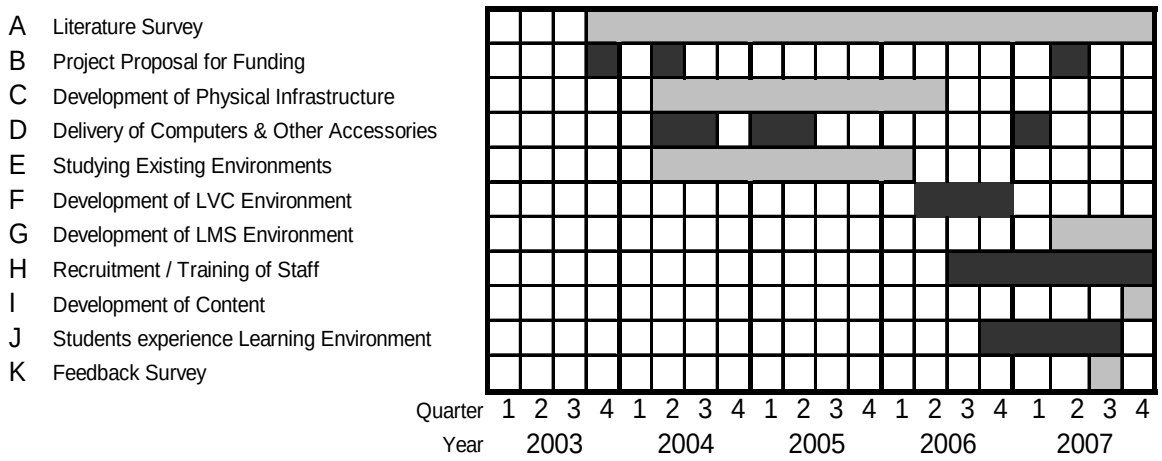


Figure 1 – Research Plan (2004-7)

The activities undertaken this exercise spanned several years. Activities A, E, K were carried out solely by the researcher, and B, F, G, H, I were carried out under the leadership of the researcher. Activity C, D took more time than initially planned for, as they relied on outside personnel. The delays were beyond the project team and was to do with administrative and technical issues with contractors/suppliers and University Administration. Activity J was carried out for initial testing during the first Semester of 2006. The New Learning Environment, with the LVC Component was inaugurated at the launch of the new wing of the Centre on 29th August 2006. The LMS Component was implemented in mid 2007 and is still under testing, and will be used formally by students during the second semester of 2007 (Starting in December). The plan below follows guidance mentioned by Johnston (2005) in implementing an Online Course.

1.4. Chapter Outline

The next chapter describes the comprehensive bibliographic literature survey carried out in order to investigate the existing research carried out in the related domains. In the third chapter, the activities carried out, and tools used and techniques followed in order to fulfil the overall study objectives are discussed. The fourth chapter presents the limitations of the existing learning environment identified, and the process of developing the new learning environment.

Chapter Five presents statistical data analysis carried out using the data collected via the student feedback evaluation sheet. The results reveal the factors which contribute to overall satisfaction in the new environment.

The final chapter includes discusses the summary of findings with reference to the environment and previous research available.

CHAPTER TWO - LITERATURE SURVEY

"The nice thing about standards is that there
are so many of them to choose from."
- Andrew S. Tanenbaum.-

The Literature Survey aimed to analyse the existing research carried in related domains in order to conceptualise a solution to match the requirement of the FMSC.

2.1. Evolution of e-Learning

e-Learning evolved primarily from the concept of distance education; which itself has it's origins from correspondence study programmes, a concept which dates back to 150 years, when the University of London offered distance learning degrees via post. Distance education can be defined as an educational situation in which the instructor and students are separated by time, location, or both. Distance education does not preclude the use of the traditional classroom.

The term e-learning has been used in different contexts. If one were to gather it's meaning from its extended form: electronic learning – it gives rise to a gamut of possibilities.

1. E-Learning is instruction that is delivered electronically, in part or wholly – via a Web browser, through the Internet or an intranet, or through multimedia platforms such as CD-ROM or DVD (Hall, 1997).
2. E-Learning is a structured, purposeful use of electronic system or computer in support of the learning process (Allen, 2003).
3. E-Learning covers a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes delivering content via the Internet, intranet/extranet (LAN/WAN), audio and videotape, satellite broadcast, interactive TV, and CD-ROM (ASTD, 2001)
4. E-learning is training delivered on a computer (including CD-ROM, Internet, or intranet) that is designed to support individual learning or organizational performance goals (Clark and Mayer, 2003).

5. Web-Based Training [WBT - an alternate term for e-learning] is the integration of instructional practices and Internet capabilities to direct a learner towards a specified level of proficiency in a specified competency (Conrad, 2000).

The definition of distance education is broader than the definition of e-learning and entails the definition of e-learning. The history of e-learning dates back to the early 1960's and has evolved rapidly upto it's current practices. The Use of Computers for e-learning came onto the education mainstream in the 1990's with the usage of CD Media – which gave rise to the term Computer Based Training (CBT). The advent of the World Wide Web created a path to a new dimension for e-learning. The First generation of web based training relied on simple web browsers, and had limitations in delivering interactive content – apart from basic text and simple graphics. With emergence of technologies such as Macromedia Flash, more interactive content development was made possible. These technical possibilities and the connected "dot com boom" of the late 1990's fuelled the interest in e-learning to exponential heights.

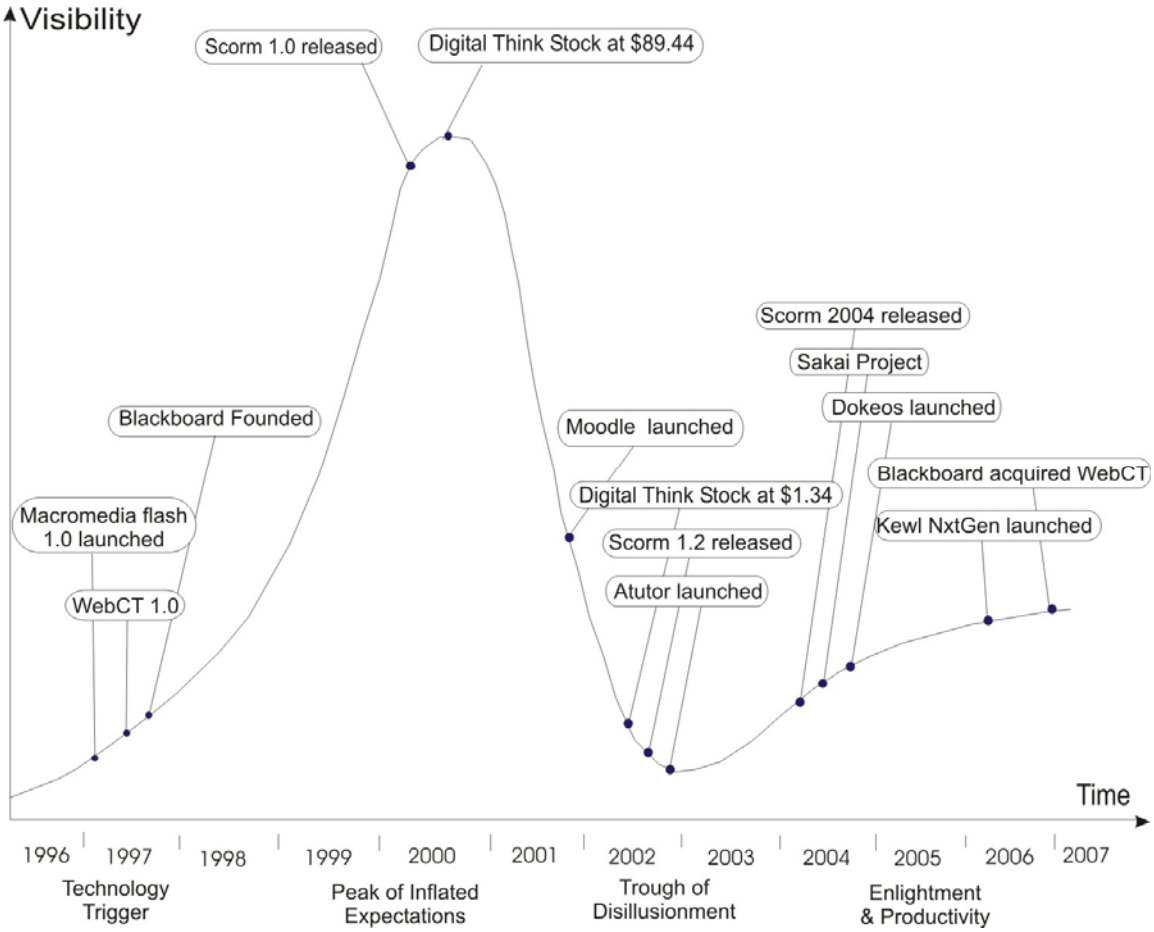


Figure 2 - E Learning Hype Cycle: Adapted from Kruse (2003)

E-learning software applications and the ventures which developed them were also victims of the infamous dot com crash of 2001. Initial attempts at developing e-learning solutions, during late 1990's were two fold with many custom built solutions competing with off the shelf packages. Custom built solutions was a costly option, and one which was designed to satisfy the immediate needs of the organisation in question. By 2003, the e-learning space was settling into a stage in which promoted re-usability and standards. The trend at this stage was on the adaptation of off-the-shelf e-learning solutions, which could then be customised.

The Gartner Hype Cycle (1995) can be superimposed to the plot the progress of e-learning solutions (See Figure 2). Kruse (2003) commented that in 2002, the industry reached the trough of disillusionment. The writer agrees that the industry is now reaching the period of enlightenment and productivity, although the trough of disillusionment probably carried on until end of 2004. A classic example of the inflated expectations can be visible with Digital Think Inc. The company, which specialises in learning solutions saw it's stock price peak at $ 89.44 in 2000, and crashed to $1.34 in less than a year. (Kruse, 2003)

2.2. Pedagogical Approach

Identifying the factors which lead to success of e-learning ventures is an important step. The pedagogical approach used in conducting in traditional learning needs to be focused on, and revised for e-learning (Miller, 2000; McDonald et al, 2000). Smart (2005) mentions that too often technology dictates which options are available to practitioners using e-learning. Clarey (2007) states that in the learning profession, although the technological environment has changed over the years, the focus, on the learner, learning outcomes, and sound instructional design hasn't changed. She further adds, that the reason why many incumbent instructors have tried to deliver instruction online unsuccessfully and even view it as ineffective may be because the same objectives and methodologies used in the traditional classroom change dynamics in the form of loss of social-contextual cues in the online class. Miller (2000) states that the critical element for success in any teaching / learning environment is the effectiveness of the instruction. He further suggests that to maximize learning opportunities, a shift in pedagogy is required.

The upper limit of the total number of students who would participate in a course was ranging in the hundreds, and this was considered a "large" student group. Cantillon (2003) equates Large Group Teaching to lecturing and considers it as an efficient method of transferring concepts and knowledge to large groups, and suggests that this process can be used to stimulate interest, explain concepts, provide core knowledge, and direct student learning. The concept of "how many students" make "large" widely differs in literature across disciplines depending on the proposed learning activities. Several Methodologies are used currently for large groups – Demonstrations, Buzz Groups, Project Work, Group Work etc, but by far the most obvious and common practice is Lectures. The literature review revealed insufficient documentation/studies on large group learning specially on imparting Software Skills in classroom environments.

2.2.1. Student Satisfaction

Student satisfaction can be defined as the student's perception pertaining to the college (University) experience and perceived value of the education received while attending an educational institution. (Astin, 1993). In examining the key factors contributing to student satisfaction, Bolliger (2004), Johnston et al (2005) mentions that the instructor is the main predictor in student satisfaction. Literature suggests that the overall satisfaction in a distance learning environment is related to the ratings of the instructor and instruction (DeBourgh, 1999; Gabrielle, 2000; So, 2006). Bowmen (2001) states that comparing distance learning with traditional classes for student satisfaction is like comparing apples to oranges; they are fundamentally different.

Other factors identified are Orientation to the technology and equipment (Johnston et al,2005; Gabrielle, 2000; Fredericksen, 2000; Wagner et al, 2005; So, 2006; Bollinger, 2004), Quality of the Content (Gabrielle, 2000), Course Structure (So, 2005), Course Management (Bollinger, 2004), contact and interaction with the instructor (Gabrielle, 2000; Fredericksen, 2000; Wagner et al, 2005), prior experience in the learner setting (Gabrielle, 2000), self-efficacy for technology, Interaction with classmates (Fredericksen, 2000; Wagner et al, 2005), Motivation to take the Course (Fredericksen, 2000) DeBourgh (1999) states that the overall satisfaction in distance education does not rely on the course format and physical separation of course participants or technology.

2.3. Blended Learning

In a strict interpretation, one could consider term "Blended Learning" as simply usage of more than one method for delivery of instructions. Other terms used by some authors (Brown,2001; Young, 2002) when referring to a course that mixes traditional face to face learning with online delivery is "hybrid" or "mixed" Learning. Allen & Seaman (2006) a blended learning course as a course that blends online and face to face delivery.

Table 1 - Types of Courses (From Allen & Seaman, 2006 pp4)

Proportion of Content Delivered Online	**Type of Course**	**Typical Description**
0%	Traditional	Course with no online technology used – content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course that uses web based technology to facilitate what is essentially a face-to-face course. Uses a course management system (CMS) or web pages to post the syllabus and assignments for example.
30% to 79%	Blended / Hybrid	Course that blends online and face to face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face to face meetings.
80%+	Online	A course where most or all of the content is delivered online. Typically have no face to face meetings.

Mortera-Gutierrez (2006) states the following on experiences in implementing Blended Learning:

"This effort has produced new and unique teaching and instructional experiences in blended learning environments (a combination with computer technology and internet components with traditional face to face teaching forms and e-learning formats) going from those environments, which are entirely e-learning (online, web-based, videoconferencing, TV-Satellite), to others which are just mediated by computer communication (using multimedia, CDRoms, Internet), and also from those environments which are just traditional face to face instructions using computer and online tools to enhance their courses."

Bersin (2004) describes six phases in which technology based training has evolved as from the 1960s into presently practiced Blended Learning.

The proliferation of software solutions at the time could be broadly categorised in two different forms

1. Depending on Software ownership and licensing – Proprietary and Open Source Solutions. In most cases, the FMSC could ill afford costly proprietary software, and preferred Open Sourced Solutions. Chapman et al (2007) argue that some Companies choose to build their own LMSs from scratch, rather than purchase a system because they may only need a fraction of the functionality of the commercial systems.

2. Depending on the tasks the application was to carry out in relation to e-learning – Authoring Tools, Developer Tools, Content Management, Virtual Classrooms, Evaluation Systems

2.4. Types of Software & Systems

2.4.1. Content Management Systems

Content Management Systems (CMS) evolved with the advent of complex web sites, and had several useful features:

1. Simplify creation and editing of online content.
2. Administration of online content.
3. Ability for collaboration on content creation and publishing
4. Archiving online content.

The content in this case can be In Text form, Images, Audio, or any other electronic computer file format. Complete articles in this system are really assembled from self contained entities, which can be referred to as content components, a concept which promotes re-use. The Wiki concept, popularised by Wikipedia is an example for a CMS.

2.4.2. Learning Management Systems

Learning Management Systems (LMS) were meant to simplify the administration of learning and training needs of an organisation, especially organisations in the education domain. LMSs are often viewed as being the starting point (or critical component) of any elearning or blended learning program, but this perspective is valid only from a management and control standpoint – it is anti ethical to the way in which most people learn today. (Siemens, 2004)

The main features of a LMS includes;

1. Learner – Centered Content
2. The ability to manage students, teachers, courses, and course contents.
3. A platform for Assessments and displaying results.
4. Monitor student participation,
5. Provide students with the ability to use interactive features such as threaded discussions
6. Adherence to standards (See Section 2.5)

Some of the features presented in an LMS, are more suitable for organisational contexts, and need to be carefully evaluated. Course Management Systems (CMS) is another term which is closely associated with LMSs. The terms are often considered equally, yet Carliner (2005) considers CMS to be online systems that were originally designed to support classroom learning in academic settings, such as universities and high schools, while LMS Learning refers to software that primarily acts as an electronic registrar by electronically performing various enrolment and related tasks. From a participant perspective, an LMS provides a central point from which learners access activities.

In selecting a suitable LMS a organisation has three options – To build a system, To use a hosted solution or to buy a solution, the latter being the most popular choice (Learning Circuits, 2006). The choice further narrows down into buying proprietary software or using open source solutions. (Refer Appendix D for a list of Proprietary Learning Management Systems and Open Source Learning Management Systems)

Kennedy (2005) states that schools in Hong Kong are rapidly taking up the use of LMSs, and that student teachers need the skills to incorporate using LMSs into their teaching and learning. His findings further showed a partial preference for Moodle, a Open Source LMS over Blackboard, the popular proprietary LMS. The Moodle user community lists sites registered by nine of the fifteen Sri Lankan Government Universities in it's website (Moodle, 2007). In Sri Lanka, most of the active implementations of Moodle are primarily used to blend with the existing, conventional face to face teaching sessions

2.4.3. Synchronous Learning Tools

Depending on the time component of distance learning, it can be categorised as synchronous learning and asynchronous learning. The use of Internet Technologies have matured significantly as at present for synchronous learning to be considered as valid for distance learning (Chen, 2004). Synchronous learning requires teachers and students to interact with each other at the same time (even from remote locations).

Most of the present solutions which fall under this category are referred to as "Live Virtual Classrooms (LVCs)". Nantel (2006) identifies that the following names also imply similar products:

- Virtual classrooms
- Live e-learning systems
- Synchronous training systems
- Live online learning systems
- Web conferencing systems

A list of the currently available LVC Software is listed in Appendix F. The features found in such software includes,

- Application file sharing
- Live demonstrations and guided practice
- Live audio/video
- virtual office hours
- student workgroups
- guided problem-solving sessions

- text chat
- quizzing and polling
- virtual labs

The majority of the products in this space are proprietary, and only one product was Open Source (in Beta as of Jan 2007). The operational model used by most of the LVCs did not provide a facility to host the server locally. These LVC's required the clients to connect to the provider's server – a feature which required costly, high bandwidth internet connections, and monthly payments for the service. As a solution to this limitation of existing products, Halse (2007) had developed a prototype LVC.

2.4.4. Content Development Products

The main purpose served by this category is to create content suitable for presentation and re-use. The Content prepared maybe exported to the product developer's proprietary LMS Suite, but is most cases today the requirement is to generate content which conforms to standards such as SCORM and AICC(CBT). The content preparation does not require programming code to be written in the basic form of Authoring Software. (See Appendix G for a list of Authoring Software). Apart from software which directly can be considered as Authoring Software, there are other categories of software such as Screen Capturing Software (Camtasia®, Screen Flash®) which can be used. Microsoft Powerpoint®, which not many e-learning developers or instructional designers think of as a tool in authoring, is the second mot frequently used software used in eLearning content authoring behind macromedia flash (eLearning Guild, 2005)

2.5. Standards & Specifications

2.5.1. Developers

1. IEEE LTSC

   The IEEE Learning Technology Standards Committee (LTSC) is chartered by the IEEE Computer Society Standards Activity Board to develop internationally accredited technical standards, recommended practices, and guides for learning technology.

2. Advanced Distributed Learning (ADL) Initiative

Advanced Distributed Learning is an initiative which was formed in 1997 as a developer and implementer of learning technologies across the United States Department of Defence. It is a collection of standards and specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content. The ADL initiative resulted in the development of the SCORM (Sharable Content Object Reference Model standard for e-Learning.

3. IMS Global Learning Consortium

The IMS(Instructional Management System) Global Learning Consortium has produced the IMS QTI (Question and Test Interoperability) Specification which defines a XML language for Interchanging questions and assessments between different systems. Several Versions have been released – 1.0, 1.2 and 2.

4. AICC: The Aviation Industry CBT (Computer-Based Training) Committee

AICC was one of the first institutions to prepare specifications related to Computer Managed Instruction Systems, back in 1993. (Called “AICC/CMI Guidelines for Interoperability" - document #CM1001). This was revised in 1998, to address web-based training. (Appendix A defines the "HTTP-based AICC/CMI Protocol" (HACP), a set of rules that govern communication between an LMS and web-based courseware.)

It was further modified in 1999, to add another appendix – B, which introduced a JavaScript application programming interface as an alternative means of communication between an LMS and courseware on the web. The JavaScript interface made it possible for developers to create AICC-compliant courseware using familiar HTML and JavaScript, without resorting to more complicated -- and often proprietary -- programming languages. (Saporta, 2004)

2.5.2. Sharable Content Object Reference Model

Sharable Content Object Reference Model (SCORM) utilizes XML (eXtensible Markup Language) and JavaScript as standards to define a protocol for application developers wanting to create instruction that can be shared between learning systems

utilizing different technologies and structures. In SCORM, basic content which is sharable is known as a sharable content object (SCO) is the smallest unit which is tracked by a LMS. Re-usability is the key concept behind SCORM, and upto now, several versions have been released (1.0, 1.1, 1.2 and SCORM 2004). SCORM 2004 is based on the work done by AICC (CBT), IMS Global Learning Consortium, IEEE and Ariadne.

Statistics reveal that AICC and SCORM 1.2 are almost equally the most popular conformance standard followed by most of the eLearning Content Users. (eLearning Guild, 2005). The same report indicates that Section 508 as a set of standards followed by a Small percentage of eLearning Content users. This is a legal requirement established by the US Government to ensure that Government agencies electronic and information technology is accessible to people with disabilities.

2.6. Comparison of LMS Features

Choosing an LMS required an in-depth study of the LMS space. Two of the initial aspects that required resolution was, the mode in which the LMS was hoped to be acquired, and the licensing mechanism adopted.

With many choices available to a prospective LMS selector, different attempts have been made to evaluate LMS features, for possible selection. Passerini (2004) has proposed an evaluation scheme by looking at interactive multimedia design guidelines that have been elaborated over the years to support computer-mediated learning. García (2006) describes an evaluation framework that is based on SCORM specifications that allow instructors the elaboration of benchmark tests to evaluate e-learning platforms. Graf & List (2005) consider evaluation of Open Source E-Learning platforms considering adaptation issues, and using the Qualitative Weight and Sum Approach.

The LMS Focus Group has published a comparison between WebCT, Sakai and Moodle (ISU, 2006). The Commonwealth of Learning(COL, 2004) has published a tool based on MS Excel® and a user guide to assist administrators evaluate LMS solutions, based again on a weighted sum of all feature score. Itmazi & Gea (2005) have considered Fifty Eight studies on elearning platforms and provide a statistical analysis.

2.7. Summary

When analysing the educational programmes space, Blended learning “blends” traditional learning with other forms, which provide new and innovative learning experiences. In comparing software solutions available, the main type of software that the course offerings centre across is an LMS. LMSs primarily facilitate asynchronous learning, while LVC software deals with synchronous learning. In any elearning activity the LMS will not bring success to eLearing ventures, without the content. And to author content, Appropriate Content Authoring tools, are needed. Standards have been developed to ensure that the developed content can be uploaded to LMSs without difficulty.

Due to many choices, both Open Source, and Proprietary available, many exercises have been undertaken to assist administrators in selecting LMS to suit their requirement. These attempt to match the available features of an LMS against desirable features requested by Administrators.

CHAPTER THREE – METHODOLOGY

> E-Learning! We need to talk about "e-forgetting," because to be successful at e-learning, you have to forget the ways of your past.
>
> —Tom Peters

This chapter consists contains descriptions of activities carried out, and tools used and techniques followed in order to fulfil the overall study objectives. A Blend of Quantitave and Qualitative Methods have been employed due to the nature of the study.

3.1. The Research Methodology

A combination of both qualitative (inductive) and quantitative (deductive) methods were employed in the this research study. The task of studying the human computer interactions within the existing environment was achieved by employing Ethnographic Methods, using qualitative approach. By living in the environment the researcher was able to focus on identifying student(user) needs and interactions between the Subject Matter Expert (lecturer), Student and Instructor. This was instrumental in creating a user centered design. The Case study method was also utilized in explaining the design and development of the new learning environment. The deductive (quantitative) method was used to carry out the sampling survey by administering a questionnaire to find out the student satisfaction and ascertain effective factors.

3.2. Study of the Existing Learning Environment

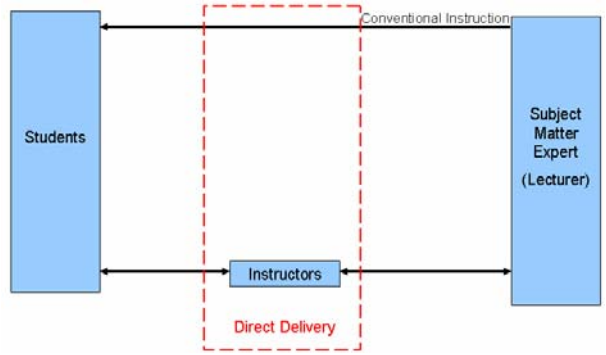


Figure 3 - Conceptual Framework : Traditional Setup

The regular teaching sessions in the ITRC were conducted with the lecturer directly addressing and instructing students following the session. Instructors (rectuited recently passed out graduates with exceptional results in related subject areas), were staff available to assist the students. The Researcher observed the procedure followed during regular sessions at the ITRC and Interviewed Lecturers, Instructors, Students, and staff who were handling technical support. The teaching difficulties, needs and wants of students & staff were noted. The current operational modes and computer & software facilities available at the ITRC was compared with other Universities and educational institutes. Since the solution requires addressing a large student group, strategies and technologies adopted in educational institutes in similar situations was observed. The researcher also discussed possible technical solutions and attributes with local suppliers. Since the exposure and experience of local solution providers was marginal, in 2005, the researcher attended CommunicAsia 2005 Conference & Exhibition in Singapore, to study the latest available technologies and to explore solutions available for synchronous learning environments. Investigations were further carried out by researching on the Internet. The efforts were useful to identify benchmarking references.

3.3. Design and Development of the New Environment

The initial step was to identify the pedagogical approach which will be used to impart application software skills at the ITRC, and decide on the software and other system components required. Once the basic architecture was designed, proposals were forwarded to funding agencies. Two new computer laboratories were to be developed as part of this new environment. A procurement plan was drawn up to purchase the items required. All activities identified were monitored using Microsoft Project. Unavoidable delays were noted, and the project was reviewed at key stages.

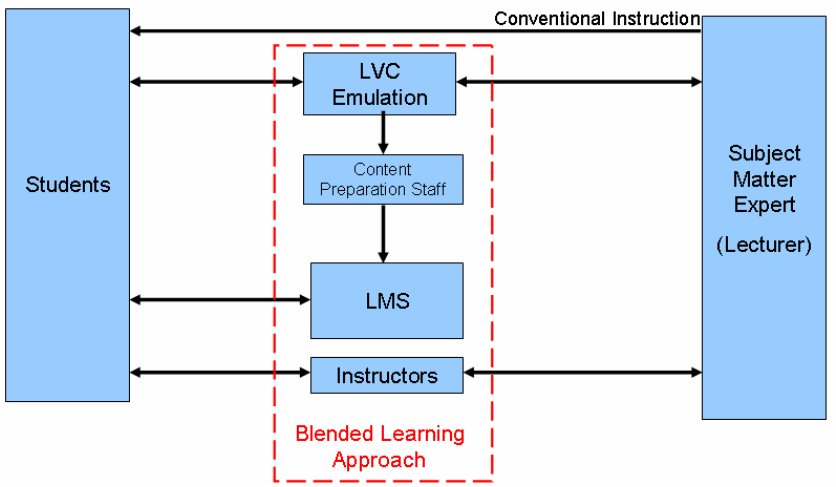


Figure 4 - Conceptual framework : Implemented

The teaching and learning process at the ITRC facilitates synchronous learning. Therefore it was decided that the proposed learning environment should contain a major component to support synchronous learning. A supplementary asynchronous learning environment was incorporated to address student support requirements.A LVC emulation Environment was planned to support synchronous learning, and implementing an LMS was decided to address the asynchronous learning activities at large.

An adaptation of the Qualitative weight and sum approach to evaluate LMSs proposed by Graf S. & List B (2005). was used to evaluate LMS features. Expert judgement was solicited whenever necessary. Features of existing LVC's were sufficient for our requirements (Live Video & Audio, Text Chat, Desktop & Application Sharing). High bandwidth connections were not an available option, and the cost factor deterred the FMSC & ITRC from exploring this option as a complete solution. Developing a custom LVC was not a viable solution in our situation, as we did not posses the expertise, nor the time to develop a solution from scratch.

3.4. Evaluation of the Implemented Solution

Out of the courses conducted at the ITRC, Two Courses viz, ACC 3305 - Financial Modelling with MS Excel (Sample A, 70 Students), BEC 3305 - Project Management using MS Project (Sample B, 230 Students) were selected as focus groups for evaluation. The rationale of selection was the fact that these two were the only classes which utilised the LVC environment. A contributory factor to this was the fact that they had prior expeirnece in the learning environment, a fact identified in the literature survey

(Gabrielle, 2000) as contributory to student satisfaction. The traditional whiteboard was not used as a part of these courses. An 8 Item survey instrument was used to gather the information.

The evaluation intended to ascertain student satisfaction with specific aspects of the physical environment (Multimedia projection, Computer, Audibility), Socio –Personal Environment (Physical Presence of Lecturer, Involvement of Instructors, and Personal Concentration), and Instructions. The evaluation form was designed based on the existing course evaluation criteria used at the FMSC. The criteria were compatible with the contributors to student satisfaction highlighted in the literature survey section 2.2.1. The data was collected in class at the end of the Semester in which the students followed the course. This survey also served as a formative evaluation, from which to identify problems and concerns to allow for modifications for future courses. The data was analysed using SPSS Version 13.0.

Hautakangas (2001) mentions that quantitative methods, such as questionnaires, are user-friendly but superficial, and Qualitative methods and their methods of representation are informative, but time-consuming. Therefore the response sheet provided room for the students to give their own views. The researcher also interviewed the Lecturer(s), Instructors and randomly selected student to get their feedback. The statistical methods used for Data analysis are T-Text, Analysis of Variance (ANOVA), Regression Analysis.

3.5. Limitations of the Study

The researcher faced difficulties in gathering detailed information on similar synchronous learning environments. Obtaining the technical details of implemented solutions was not possible in certain instances. Funding for such investigations, especially foreign - was not sponsored, and privately arranged by the researcher. The implementation was limited to the ITRC, and did not broadly extend to other computer laboratories of the University of Sri Jayewardenepura due to administrational and operational difficulties. Funding for such projects is usually allocated on a faculty basis and the funding was mainly for capital expenditure. Purchasing physical resources such as Computers were given priority, and as such the opportunity to purchase proprietary software which could be used in the Learning Environment was limited. The staff

involved did not get any formal specialised training and most were on the job and by experience.

3.6. Summary

At the completion of the literature survey, a few directions on form of the new environment were visible. The case study method was adopted to develop the Learning Environment. The first step was to learn from the existing environment and compare with similar learning environments. The Structure of proposed environment could be visualised at this stage, and based on that a project plan was developed. Once the system was implemented, to measure the student satisfaction levels, a feedback questionnaire was designed. The Interview method was also adopted to gather detailed responses.

CHAPTER FOUR – LEARNING ENVIRONMENT

"Television can teach. It can illuminate.
Yes, it can even inspire. But it can do so only to the extent
that humans are determined to use it to those ends.
Otherwise, it is merely lights and wires in a box"

-Edward R. Murrow-

4.1. Limitations of Existing Learning Environment

4.1.1. Infrastructure

The existing environment of the ITRC as of 2002, was equipped with two computer laboratories, which were inadequate to serve a student population of over 4000. Additional slots were obtained from separate computer centres such as the main computer centre of the University. The network at the time consisted of a Novell Netware 5 Server, with client software on the Personal Computers, which were running Microsoft Windows® Operating Systems. The need to migrate to a Client Server Environment on Microsoft Windows® Based Desktops was identified.

4.1.2. Human Resource

The existing staff for the centre comprised of a Coordinator, who was a lecturer of the faculty, serving on a part time basis, and a team of Demonstrators, who served on a temporary basis. To maintain the facility on a long term basis a, a request was submitted to the UGC justifying the need to recruit permanent staff. After many delays, in 2006, the Government Treasury / Finance Ministry did approve the requirement, which resulted in a cadre of Five Permanent Instructors being approved for the ITRC, to supplement the cadre of .Temporary demonstrators. In addition an Assistant Network Manager position and Two Technician positions were approved. This staff can be used to maintain the basic facilities provided by the ITRC, but is insufficient to expand it's services. Some of the lecturers, who were conducting training sessions, had not followed a formal teaching methodology course. On Interviewing the staff who had followed such courses, the researcher identified that the current teaching methodology courses conducted locally had minimal focus on Computer Based Instruction.

4.1.3. Teaching / Instructing Process

In the lab sessions, the students follow the demonstrations provided by a subject expert (Lecturer). Depending on the course, the students are provided a printed handbook, prepared by the lecturer. Students who are absent from a session, would have to follow the missed sessions using the handbook, or with the assistance of the lecturer or an Instructor/Demonstrator. This was one requirement aspect of which needed a possible solution. Another aspect was to provide a platform to discuss problems related to their sessions. Yet another requirement was to allow students to provide feedback on sessions (Survey), and to have a basic formative assessment which was intended only to provide the student a indication on his/her knowledge gained from the session. (This assessment was not intended to be a certain measure of the skill possessed by a student). The Major software aspects/concerns of the requirements were meant to be satisfied with the introduction of an appropriate LMS. The requirement at the University and the nature of study courses had the freedom of adaptability for researcher to experiment with a blended learning solution to facilitate a solution for the problematic situation highlighted in the introduction.

4.2. Development of the Learning Environment

4.2.1. Infrastructure

A two proposals submitted to the University Grants Commission in 2003 and 2004 (Competitive grant won in 2004) enabled the faculty to receive a sum of Rs. Thirty One Million for the expansion of the facility. The key concept which was in the proposal was a development of the new learning environment to encompass the existing computer laboratories, and two new computer laboratories, which were refurbished classrooms . (Summary of Items received is annexed in Appendix C). The new Learning Environment (LE) accommodated Two Hundred and Fifty computers over Four Computer Laboratories. A feature which was integrated to the facility was to accommodate broadcasting of lectures from one lab to another – facilitating a virtual classroom environment. All Labs were located within a fifty meter distance of each other. (Refer Appendix I for System Configuration Map). In the allocation of the direct session and virtual (remote) classroom among the students, Students were given a choice

to select between the classrooms on a first come first serve basis, and even at randomly. We identified three elements which were essential to the Virtual Classroom Environment:

1. The Lecturer's Voice Delivery

   This was broadcasted via separately cabled, Audio Broadcast system consisting of a matrix switch which could enable the lecturer to address any of the four computer laboratories, or all of them. The lecturer was free to roam in between the classrooms, although switching was performed at a central location. This was basically a one way system, although it had the option of a student in the remote class being handed over a (wireless) microphone on request to pose questions to the lecturer in a different lab during a Question & Answer time at the end of each session. The system was implemented in such a way that the voice quality was maintained at every location to match the natural timbre. The system could accommodate sound inputs from PCs at each lab (Lecturer Machine), as well as Inputs from a Console Microphone in the Main Control Room (MCR). Using Shareware software – Business Music System, the staff have programmed notices to be broadcasted to classes at the beginning and end of sessions. For student practice sessions, instrumental background music is played from the same software.

2. The steps administered by the Lecturer on the Computer Screen (Desktop)

   The initial strategy adopted was to use transmission via the network using the Software known as RealVNC. However this only allowed a broadcast to a single client, with only a very basic set of features. The current solution used commercial classroom management software - Net Support School. The procedure adopted was to broadcast the demonstration from the lecturer's machine in one lab to the lecturer machines (unoccupied) in the remaining labs. If required the control could be transferred to the remote lab, which meant that the lecturer can conduct the class from a different lab as well. The Steps are recorded into Screenflash® for later retrieval. The system uses the existing CAT5e Cabling and Gigabit Ethernet Switches and Network Infrastructure to provide the connectivity. The effect of Network Traffic was tested prior to the software being used in class.

3. The Lecturer's Image at the Virtual Classroom

Faithful reproduction of the lecturer's Image at the remote screen conveys a vital segment of the presentation by image of the body language and the gestures as viewed by the student comfortably. The lecturer's image at the remote screens was enabled through a set of video gear (Single CCD Mini DV Video Camera, Video Amplifier, Cabling, and Multimedia Projectors).

The system could be used to capture the video stream and audio onto a media file, using a video capture device. The system provided provisions to broadcast Any MiniDV and VHS tape, Television signal to any of the classrooms. The Control Elements of the system were located at a separate location - the Main Control Room. (See Appendix I)

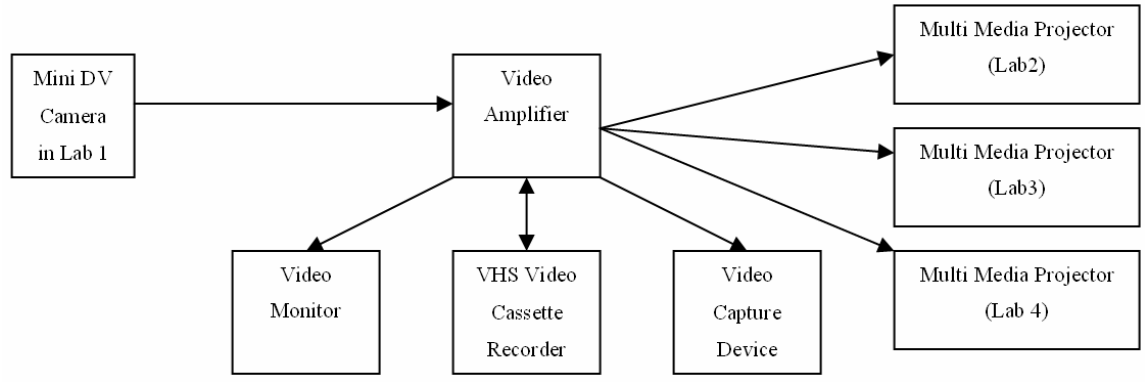


Figure 5 - Block Diagram of the Video Capture and Broadcasting System

In each of the virtual learning environments (remote computer laboratories) two Multimedia projectors created the near perfect lecturer's image. It is possible to use one projector in a remote location depending on the resources availability, with a switching arrangement to switch between RGB Input (Computer Desktop) and the Video Input (Lecturer's Image Video). This arrangement was designed by the author and fabricated by the ITRC staff.

Figure 6 - Snapshot from the Live Classroom

Figure 7 - Snapshot from the Remote Classroom with two projection screens

To maintain the interactive nature required in a regular lecture, network cameras with remote pan and tilt to monitor the remote locations was available. (See figure 5). The lecturer could view, and interact with the any of the local or remote student desktops using Net Support School, Software. (See figure 6).

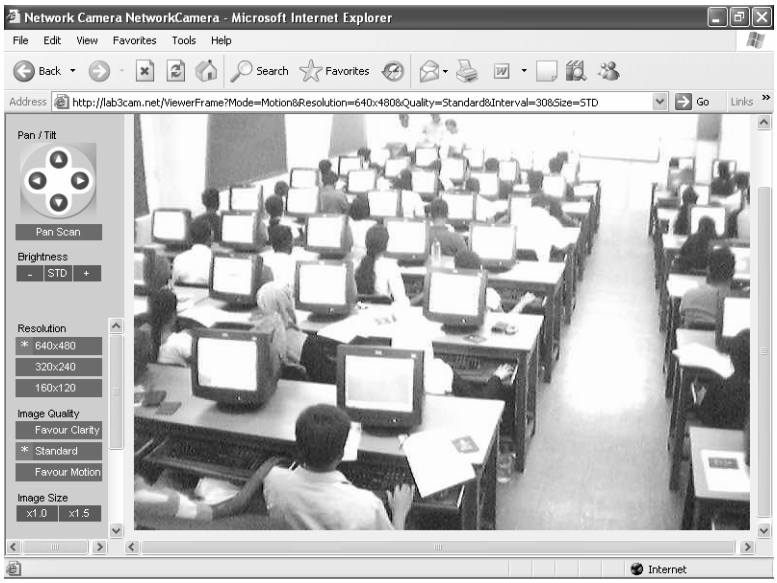


Figure 8 - View of the Remote Classroom (Via Web Browser)

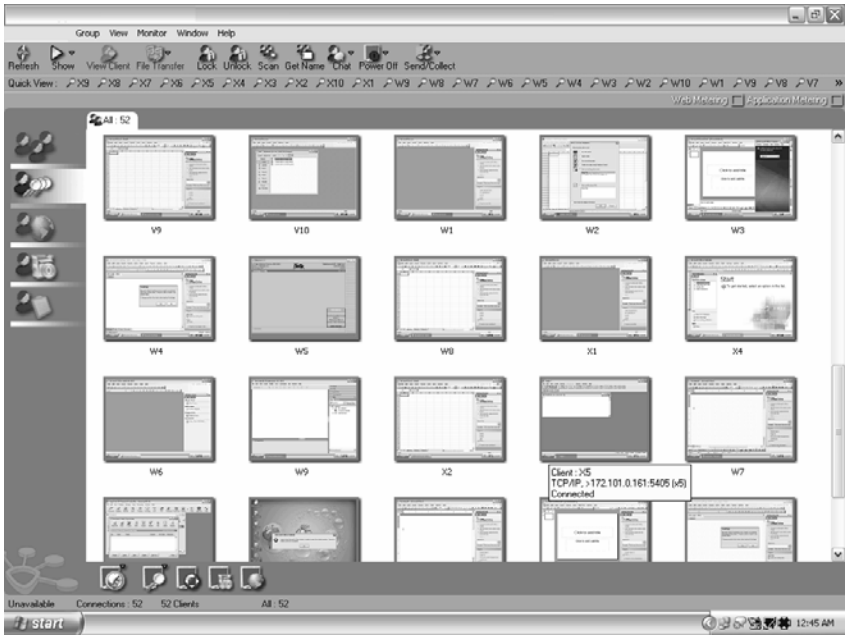


Figure 9 - View of Student Desktops from the Lecturer

Apart from the question and answer session, Microsoft® NetMeeting, Microsoft Office Communicator Live Messenger Software were available, as a medium to conduct text chat between students and the lecturer. Additionally in each classroom at least two instructors was present, to assist the students – the instructor played the role of a teaching assistant, and coordinated with the main lecturer.

4.2.2. Human Resources

The staff recruited had several roles to play in relation to the setting up of the Learning Environment.

1. Managing the Computers and Network Infrastructure (Technician)
2. Administration of the Windows 2003 Server Domain
3. Administration of the LMS
4. Instructing in Classes
5. Instructional Design
6. Content Preparation

Since it was important that the staff involved in the process have an advanced idea of what learning under such an environment meant the most of the staff members enrolled in an on-line e learning course at the Asian Development Bank Institute (Distance Learning Centre). Most of the staff voiced that the keeping up the motivation was a factor that needed attention. 10 Staff Members completed the course and received certificates from the ADBI. Tasks 1,2,4 were assigned to personnel based on their job title. However, Administration of the LMS, which was still in testing, was carried out by a Instructor, who had followed a Training Course on E-Learning technologies conducted by the e-learning centre of the UCSC. The Instructional design aspect, which was identified as a requirement could not be fulfilled upto expectation without the availability of full time formally trained personnel. Content preparation was limited to basic preparation of guides, hosted using Adobe® PDF, Microsoft Powerpoint®, and Screen Flash®.

4.2.3. Selection of a Learning Management System

The ITRC's initial intention was to use a exiting LMS platform on it's own local area network, the alternatives of using a hosted solution, and building a system for it's own requirements proving costlier. Out of the existing platforms, an open-source solution was the more viable solution for the University. Using the LMS Selection criterion mentioned by Graf S. & List B (2005), expert judgement, and due to the fact that prior training familiarisation on administration of the LMS, Moodle was selected as the LMS for the testing period. The implementation plan was to test it with the students who were using the LVC environment, and later expand the usage to other courses.

Moodle(2007) was specifically built around a social constructivist philosophy which portrays the learner as an active conceptualiser within a socially interactive learning environment. Social constructivism is an epistemology, or way of knowing, in which learners collaborate reflectively to co-construct new understandings, especially in the context of mutual inquiry grounded in their personal experience.

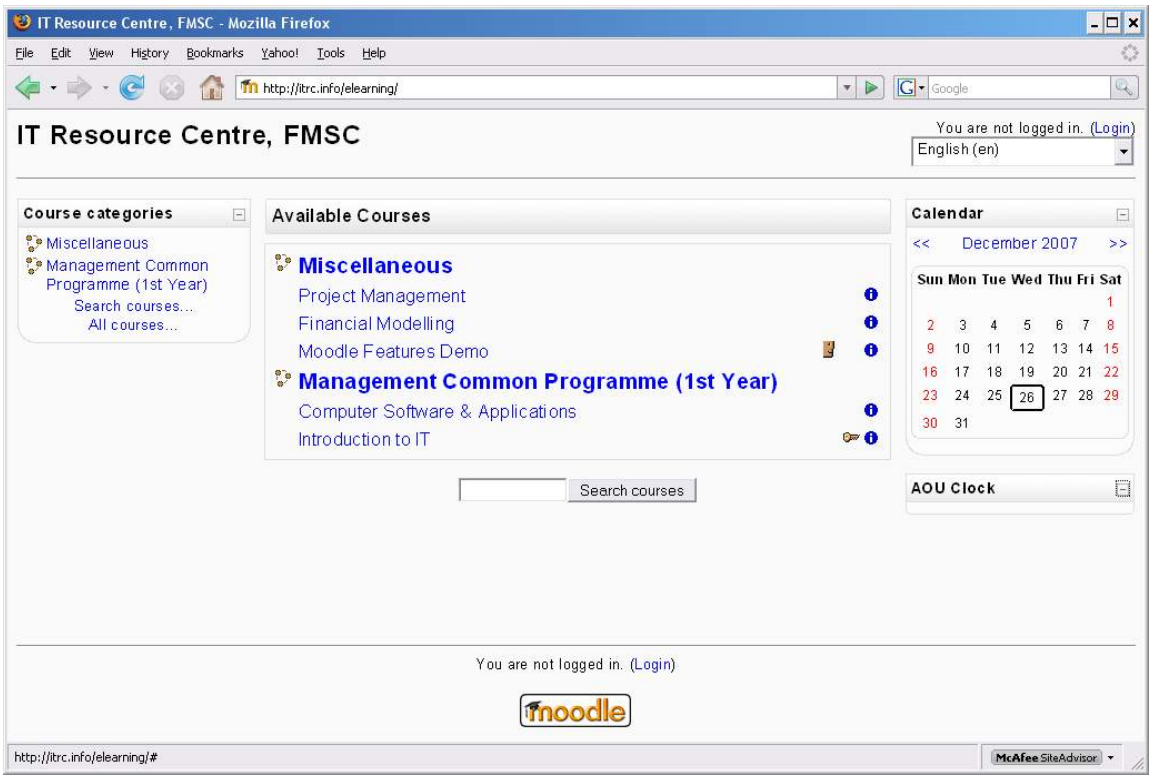


Figure 10 - Moodle Implementation Screenshot

4.3. Integrating Pedagogy

The Changes to current practices had to start with the course design itself. However, effecting this immediately was not possible, and the ultimate decision over such task would have to be done at the Departments which offer the course (In the case of the two subjects from which evaluation were taken, it was the Department of Accounting and Department of Business Economics took up the challenging feat. The Sessions had to be planned, and timed to a maximum of 1 ½ hrs of teaching, to facilitate technical issues and discussion. It was important that the lecturer, and the team of instructors who would be present, have a initial discussion (This practice was already present, as the same content was repeated over several sessions to multiple groups of students using different lecturers).

On observation of the initial sessions, a guideline sheet was prepared to educate the Lecturer, Instructor, and Students on the functioning of the system. The structure of how the Q & A session should be conducted, and How to use the text chat feature was also included. Another suggestion that was incorporated was a “breather” – a 5 to 10 minute break after completion of each subtopic within the two hour session. This was used to allow the students clear any doubts with the instructor and, if required with the lecturer. Some of the lecturers also visited the other classes physically.

4.4. Summary

The Limitations of the existing learning environment were identified in terms of Infrastructural, Human Resource and the Instructional Process. To facilitate the requirements identified, the need to have a learning environment which has Synchronous and asynchronous aspects was planned. The Video and Audio components of the lecture were broadcasted using separate cabling to remote classrooms. The Desktop was broadcasted using the existing local area network. Moodle was selected as the chosen as the software to facilitate the asynchronous learning environment. The process of delivering a lecturer had to be changed to match the requirements of the new environment.

CHAPTER FIVE - EVALUATION OF LEARNING ENVIRONMENT

The designed evaluation sheet was distributed by Instructors who had been guided on how to assist the students on filling the survey, if required. In addition to the evaluation, the researcher carried out interviews with the course lecturer, and the instructors present in the classroom.

5.1. Data Analysis and Results

5.1.1. Composition of the Sample

The target Student group was 95 for Financial Modelling and 231 for Project Management. The response rate was 49% and 85% respectively.

Table 2 - The Overall Sample by the course type

	No. of Respondents	Percent
Financial Modelling	47	19.3
Project Management	197	80.7
Total	244	100.0

Table 3 - Composition of the sample by Gender

		Financial Modelling	Project Management	Total
Gender	Male	13	76	89
	Female	34	63	97
Total		47	139	186

Table 4 - Composition of the Sample by the usage of Computers

Usage of Computers		Financial Modelling	Project Management	Total
Very Rare	Count	5	4	9
	%	10.6%	2.9%	4.8%
Rare	Count	8	9	17
	%	17.0%	6.4%	9.1%
Average	Count	18	76	94
	%	38.3%	54.3%	50.3%
Frequent	Count	10	38	48
	%	21.3%	27.1%	25.7%
Very Frequent	Count	6	13	19
	%	12.8%	9.3%	10.2%
Total	Count	47	140	187
	%	100.0%	100.0%	100.0%

Table 5 - Composition of the sample by level of English knowledge

English Knowledge		Financial Modelling	Project Management	Total
Poor	Count	1	5	6
	%	2.1%	3.5%	3.2%
Fair	Count	31	91	122
	%	66.0%	64.5%	64.9%
Good	Count	15	45	60
	%	31.9%	31.9%	31.9%
Total	Count	47	141	188
	%	100.0%	100.0%	100.0%

The level of English knowledge of the students in both courses is in the majority for good or fair level (96.8%). Since the medium of instruction is English, this level is relevant for the Instruction sessions.

The Computer usage of the students in both courses is at least at average level, which is 86.2% from the overall. This is appropriate for the subjects, taught, as well as better utilisation of the proposed LMS Environment..

5.1.2. Comparison of Environmental and Instructional factors

(by the session type)

Table 6 - Descriptive Statistics of the Comparison by Session

	Session	N	Mean	Std. Deviation	Std. Error Mean
Understandibility - Screen Explanations	Remote Session	137	3.63	.840	.072
	Direct Session	209	3.91	.794	.055
Audibility of Lecturer	Remote Session	137	3.55	.822	.070
	Direct Session	206	3.79	.798	.056
Visibility of Demonstration	Remote Session	137	3.70	.731	.062
	Direct Session	208	3.87	.805	.056
Physical Presence of Lecturer	Remote Session	131	3.56	.929	.081
	Direct Session	208	3.79	1.031	.071
Concentration	Remote Session	129	3.47	.719	.063
	Direct Session	195	3.66	.687	.049
Involvement of Instructors	Remote Session	130	3.77	.812	.071
	Direct Session	206	4.00	.881	.061
Technical Difficulties	Remote Session	129	3.32	.927	.082
	Direct Session	208	3.35	.877	.061

Table 7 - T Test Results of the Comparison by Session

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	p-value	t	df	p-value (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Understandibility - Screen Explanations	Equal variances assumed	3.966	.047	-3.149	344	.002	-.281	.089	-.457	-.106
	Equal variances not assumed			-3.112	279.365	.002	-.281	.090	-.459	-.103
Audibility of Lecturer	Equal variances assumed	.994	.320	-2.683	341	.008	-.239	.089	-.414	-.064
	Equal variances not assumed			-2.667	285.494	.008	-.239	.090	-.415	-.063
Visibility of Demonstration	Equal variances assumed	.060	.807	-1.926	343	.055	-.165	.085	-.333	.003
	Equal variances not assumed			-1.965	310.050	.050	-.165	.084	-.330	.000
Physical Presence of Lecturer	Equal variances assumed	1.293	.256	-2.062	337	.040	-.228	.111	-.446	-.011
	Equal variances not assumed			-2.111	297.519	.036	-.228	.108	-.441	-.016
Concentration	Equal variances assumed	.935	.334	-2.473	322	.014	-.196	.079	-.353	-.040
	Equal variances not assumed			-2.450	265.644	.015	-.196	.080	-.354	-.039
Involvement of Instructors	Equal variances assumed	.013	.909	-2.461	334	.014	-.236	.096	-.424	-.047
	Equal variances not assumed			-2.506	290.752	.013	-.236	.094	-.421	-.051
Technical Difficulties	Equal variances assumed	.367	.545	-.282	335	.778	-.028	.100	-.226	.169
	Equal variances not assumed			-.278	259.943	.781	-.028	.102	-.229	.172

According to the results, Understandability, Audibility, Physical Presence of Lecturer, Concentration, and Involvement of Instructors received significantly different average scores among the two sessions at 5% level of significance and according to the 95% confidence intervals of mean differences, the average scores are lower for the remote session in all of the above significant variables. The average score for Visibility is different among the two sessions at 10% level of significance. There is no significant difference observed for Technical Difficulties between the two sessions.

Therefore it can be concluded that the perceived effectiveness is significantly lower for the majority of the environmental & instructional factors at the remote session.

5.1.3. Identification of effective factors for the overall satisfaction.

In order to identify the effective factors for the overall satisfaction, along with the environmental and instructional variables, Session type, Course, Gender, English Knowledge and Usage of Computers were considered. To statistically test the relationships, ANOVA with covariates was used. Appropriate set of interaction effects were also taken in order to test the moderate effects from the session type over the environmental and instructional factors.

According to the results in table 7, Session & Understandability, and Session & Audibility interactions are significant at 5% and 10% level of significant levels respectively. This implies that the effect of Understandability and audibility on the satisfaction changes according to the type of the session. Technical difficulties, Session, Understandability, Audibility and Visibility indicates direct influences on the satisfaction at 5% level of significance, and audibility at 10% level of significance. Gender, English Knowledge, Usage of Computers, or Course Type are not significant for change the level of satisfaction.

The above significant effects are taken into a regression model in order to identify the nature of the relationships. Stepwise selection procedure is applied in order to refine the marginal significant situations.

Table 8 – ANOVA of the test to identify effective factors for Overall Satisfaction

Source	Type III Sum of Squares	df	Mean Square	F	p-value
Corrected Model	78.351(a)	24	3.265	10.709	.000
Intercept	.514	1	.514	1.685	.196
Gender	.059	1	.059	.193	.661
English Knowledge	.357	2	.178	.585	.558
Usage of Computers	.706	4	.177	.579	.678
Course	.080	1	.080	.262	.610
Session	2.593	1	2.593	8.506	.004
Understandability	5.792	1	5.792	19.001	.000
Audibility	1.977	1	1.977	6.486	.012
Visibility	3.262	1	3.262	10.701	.001
Presence	.094	1	.094	.308	.579
Concentration	1.093	1	1.093	3.586	.060
Instructors	.423	1	.423	1.388	.240
Technical	1.383	1	1.383	4.536	.034
Course * Session	.275	1	.275	.902	.343
Session * Understandability	2.774	1	2.774	9.099	.003
Session * Audibility	1.102	1	1.102	3.614	.059
Session * Visibility	.264	1	.264	.864	.354
Session * Presence	.225	1	.225	.738	.391
Session * Concentration	.200	1	.200	.656	.419
Session * Instructors	.046	1	.046	.150	.699
Session * Technical	.049	1	.049	.161	.688
Error	62.801	206	.305		
Total	3726.000	231			
Corrected Total	141.152	230			

Table 9 - Regression Analysis

Dependent Variable: Overall Satisfaction

Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.736(i)	.542	.531	.543

ANOVA

Model		Sum of Squares	df	Mean Square	F	p-value
9	Regression	102.287	7	14.612	49.613	.000
	Residual	86.591	294	.295		
	Total	188.877	301			

Predictors: (Constant), Visibility of Demonstration, Audibility of Lecturer, Technical Difficulties, Session, Session_Understand, Session_Audibility, Concentration, Dependent Variable: Overall Satisfaction

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	.808	.242		3.342	.001
Visibility of Demonstration	.233	.051	.222	4.517	.000
Audibility of Lecturer	.380	.056	.391	6.726	.000
Technical Difficulties	.108	.039	.121	2.764	.006
Session (0-Direct, 1-Indirect)	-.764	.317	-.470	-2.414	.016
Session_Understand	.449	.086	1.053	5.221	.000
Session_Audibility	-.307	.099	-.707	-3.086	.002
Concentration	.127	.051	.112	2.489	.013

The Result of the stepwise regression analysis provides the significant coefficients at 5% level of significance. Visibility of Demonstration, Audibility of Lecturer, Technical Difficulties (Preferably - Non existence), and Concentration lead to increase the satisfaction. When compared with the direct session, indirect session leads to lower the level of satisfaction. According to the significance of the interaction effects, by the remote session, the effect of Understandability on satisfaction tends to increase while the effect from audibility on satisfaction tends to decrease.

These results imply that the implementation of the remote (indirect) session leads to lowering the satisfaction level, while influencing the relationships from Understandability and audibility on satisfaction.

5.2. Results of the Open Feedback and Interviews

All of the instructors present in the sessions, the Lecturers and randomly selected students were interviewed. Selected extracts of the open feedback are published in Appendix H

5.2.1. Students Feedback

Based on the additional comments given by students, and the above data, the students in the remote location indicated a lesser overall satisfaction level than in the live classroom for all variables (average). The Majority preferred to be in a situation where the lecturer was “live”, some had provided reasons for their preference – as one student mentioned, the information was the same, but the lecturer is not continuously observing the remote location, and as such opportunities to pause the lecturer (for clarifications or other requirements) were less in the remote class. This was probably due to the lecturers delivery addressing students in the direct session, and perhaps making less attempt to indicate to the students in the remote students that he/she was following them as well. Although the lecturer had access to the individual desktops of students (via Net Support School), this feature was not used heavily by the lecturer, and as such this could have contributed to the students feeling that the lecturer was actively involved with them. This was a welcome solution from the lecturer’s viewpoint, in near perfect solution rather than conducting several sessions of the same subject

However there were comments which were promising as well – as one student pointed out, it is better to be in the front row in the remote location rather than being in the last row of the “live” classroom, as it provides a better screen visibility. The involvement of instructors was important, especially to students at the remote location. A few students indicated that they have previously experience such a environment, although not a computer laboratory the environment being a regular classroom session for G.C.E. Advanced Level supplementary education classes in which the lecturer was not present, and was delivering the lecture from a remote classroom. These students indicated that they were comfortable with the new learning environment of the ITRC. A significant number of the interviewed students indicated that during the very first sessions, they did have difficulties in adjusting to the environment, but as their

experience in the environment grew, they became more familiar. This was a typical learning curve effect visible in getting accustomed to the new environment.

5.2.2. Lecturer's Feedback

Three Lecturers who conducted sessions (which included additional subjects, in the students were not evaluated). The lecturer's initial impression was that it makes it very easy for him/her as it eliminates the need to conduct repeated sessions. However, the lecturers involved were aware of the additional responsibilities that came with the introduction. Motivating lecturers to change their style was observed as a challenge. Again similar to students the learning curve effect was observable and the lecturers indicated it themselves. Another, previously unexpected view was that although this would increase the workload of the lecturers in the session, it does not reflect properly on their individual timetables.

5.2.3. Instructor's Feedback

Instructor's comments were indicating no major difference in either environment. However, some instructor's who were less experienced found it difficult to handle the remote session, as they would be unable to directly contact the lecturer in case of requirement. The Online chat interface was suggested as a remedy. It was made clear that at least two instructors, subject to a student to instructor ratio of 1:20 needed to be in each laboratory to enable the proper productivity of classes.

5.3. Limitations of the New Learning Environment

Analysing the feedback received the authors list below several limitations of the current system and the suggested remedial actions to be implemented.

1. Capturing movement of the lecturer via Video Camera.

   This solution further needs to be refined as the current setup does not permit capture of the lecturer view if he/she is moving around the class. The existing Single CCD Camera does not provide a bright picture quality under normal lighting conditions. Providing artificial lighting was not a welcome solution from the

lecturer's point of view. Solutions for the above problems are, to use a Three CCD Camera, ideally with a remote pan and tilt control, or with voice tracking option.

2. Usage of Open Sourced LVC Software for Desktop Sharing

   Since the current software used is a commercially sold one, the cost of licensing increases with the addition of each desktop, if the desktop observation was included. Exploring the availability of open sourced solutions for the Desktop Sharing and Monitoring Solution is a need.

3. Limiting the Lecturer's ability to roam in the class.

   Since the camera was projected at the front of the class, and at a designated are, the lecturer had to complete all the instructions within that area. Using a Tablet PC, with Wi-Fi connectivity, it is possible for the lecturer to move around classes while explaining. This is yet to be implemented.

4. Capturing of Whiteboard Notes via an electronic whiteboard.

   The present system is that it has no provision to capture the whiteboard text and transmit it to the remote location and/or store for future use. This was a factor that had to be either covered by the Video Camera, or by an electronic whiteboard mechanism.

5. Limited Interactions between the Student and Lecturer in Remote Labs

   The Lecturer's need to encourage the remote students to actively participate in the lecture. The Students in the remote class, need periodic attention directed at them to keep their interest at times. This required the lecturer to be aware, and the lesson flow had to contain ingredients which assured the remote students that they were active participants of the session as well. Increasing the Instructor to Students Ratio in remote classes may also help, as in the remote class, since students cannot pause the lecturer, they need assistance via instructors, much more than in the live lecturer session.

6. Student's motivation to use the LMS

The Moodle implementation which is on test at the moment contains a limited amount of interaction opportunities to students. This is mainly due to the fact that the SMEs for the subject are from the respective departments that offer the course, and it has been difficult to get them to contribute during the on-going semester.

7. Expansion of facility needs additional cabling.

   Since the three components of the lecture are transmitted using separate cables, expansion of the facility requires a significant amount of cables. The solution is to utilise the network for broadcasting of Audio & Video. With additional bandwidth and bandwidth management, it should be possible to send the Voice and Video Elements via the network too. However the need to ensure that the Quality of Service was not affected is a primary concern here. In the ultimate scenario, data pertaining to the Lecturers Movement & Voice (Video & Audio), the Lecturer's Desktop Screen, and the Files Saved on the Remote File Servers will be using the network bandwidth.

8. Demand on Access for the teaching Material. (Via Video Streaming)

   Using a dedicated video server, it is possible to recoding the video/voice/data elements, to allow on demand access for students, via the LAN. (even if student miss a important segment of the current lecturer, they should be able to replay it) This flexible learning approach is yet infeasible for students to access this information from a remote location. The current practice is limited to providing flash based animations on selected scenarios. (For example if a student misses the class, to access the lesson from their internship locations)

In conjunction with this research study's assumptions, there are some limitations to this study that may limit its generalizability to other research settings. The subjects being taught in this case were Application Software packages. The findings of this study might not be generalizable to the entire spectrum of Learning Environments. The results may be indicative of only the responding sample and boundaries of this population of learners. The Students who participated in the survey were third year Undergraduates, who had previously followed the basics of MS Office Applications in a 120 Hour practical course. The researcher also encountered limitations due to funding..

5.4. Summary

The evaluation carried out intended to ascertain student satisfaction with specific aspects of the physical environment (Multimedia projection, Computer, Audibility), Socio – Personal Environment (Physical Presence of Lecturer, Involvement of Instructors, and Personal Concentration), and Instructions. The statistical analysis reveals that Visibility of Demonstration, Audibility of Lecturer, Technical Difficulties (Preferably - Non existence), and Concentration lead to increase the satisfaction. When compared with the direct session, indirect session leads to lower the level of satisfaction. The effect of Understandability on satisfaction tends to increase while the effect from audibility on satisfaction tends to decrease in the remote session, when compared with the live session.

The results reveal that the remote (indirect) session leads to lowering the satisfaction level, although the student perception even in the remote session indicated that they are yet satisfied with it. The Interviews conducted with Students, Lecturers and Instructors provide valuable insights into their perception.

CHAPTER SIX – CONCLUSION

Research is to see what everybody else has seen,
and to think what nobody else has thought"

Albert Szent-Gyorgyi

6.1. Conclusion and Outcome

In introducing computer based learning environment to large groups of students, a limited resource footprint is a reality in the Sri Lankan context. Addressing a large student group can lead to a considerable loss of individual attention, while splitting the group into smaller teams can lead to a unbalanced delivery between the team sessions. The cost of utilizing a skilled trainer and other resources will also be expensive. Our approach to overcome the problem in creating a suitable practical solution was with a heavy focus on a low economical technology support model. In the newly developed learning environment, the Lecturer can accommodate a maximum number of undergraduates and the lecturer expertise is distributed to all undergraduates in a fashion in keeping to the art of technology.

The LVC emulation system has been in operation for two semesters now, in the first semester the system was used on a experimental status. During the first semester, there were few technical issues to be cleared out, with troubleshooting guidelines and procedures in being adopted. The LMS was used to supplement the synchronous learning, and to provide additional learner support by way of discussion forums and learning materials. The long term goal was to use the platform created under this phase to launch the LMS as a learner support feature to all students who use the ITRC premises. Once the learner is familiar with the LMS, it can be used further, with the ultimate aim of providing remote access. In facilitating large student numbers, this is essential to add value to their in class sessions.

The feedback obtained by way of a Questionnaire with open ended questions and Interviews reveals the students still prefer a live lecturer over to the virtual classroom. The students generally indicated that they can follow the lessons without major

hindrances even from the remote classroom in the blended learning environment they were involved with. The overall satisfaction from the learning environment is dependent upon the visibility of demonstration, audibility of Lecturer, and minimum amount of technical difficulties. It also revealed that the presence of the lecturer is not a significant factor that affects the student satisfaction and perception. In interviews, a common feature was that all parties (Lecturer, Student, and Instructor) felt that the environment was a new experience to them, and that with time and familiarisation, they felt relatively comfortable, with respect to the new technology. To further maximize the productivity, all parties involved, particularly the Lecturers, Instructors and technology support personnel of the ITRC, need to have more collaboration and understanding. These findings are consistent with the findings of MacDonald et al (2000). In the similar lines it will take few semesters for the staff, students, and support staff to get accustomed to the technology.

The researcher's inference is that the Faculty requires a degree of training in interactive, student-centered course design and on-camera techniques for video (i.e. speaking to the camera) before they use the technology to handle blended learning exposures of this nature. Adequate funding for training must be factored into the overall annual budget. The training component may also act as a motivator for staff. The positions of Instructional Designer and Content Developer needs to be filled by full time staff members to maintain the quality of the learning environment.. Efforts to increase the Instructor to Students Ratio in remote classrooms should also be matched by utilising suitably qualified staff.

The system can be further expanded with the incorporation of further system elements. The schematic layout of the system was designed in a way to support such an expansion in the future. This system expansion will be beneficial in handling large numbers of students, especially for the double batch which is currently being processed. The Researcher's solution has addressed the Infrastructure (Hardware & especially Software) aspects, Human Resource requirements, and Procedural changes required to integrate the solution more number of students. The use of the LMS will facilitate managing large number of students, and can be beneficial in assisting students who will access the system from a remote location. Incorporation of appropriate content and Instructional Design, will enable to create a shift from an instructor-directed environment

to a learner requirements - directed focus, which will facilitate self paced learning. The cost factor involved in the additional infrastructure is in the region of Rs. 900,000, (Ref. Appendix C). There are no monthly licensing fees, and recurring expenditure on bandwidth costs etc.

At present many organisations, Universities are surmounted with pressures accommodate more interfaced subject matter to society. The benefits of this type of innovative technology enhanced learning system to accommodate more number of undergraduates will be beneficial to any organisation. With the incorporation of further expansion this system can also serve to enhance the fee levying courses of the FMSC (Diploma/Advanced Diploma/Post Graduate)

The necessity to develop IT facilities and associated technologies in academic institutions is omnipresent in Sri Lanka. The efficient use of IT resources is also of concern. Stakeholders, and Administrators of these academic institutions can take into consideration the aforementioned recommendations, which will certainly be beneficial in developing similar environments, and also it may contribute to a better understanding of the factors that students perceive as important in a virtual learning environment.

6.2. Future Work

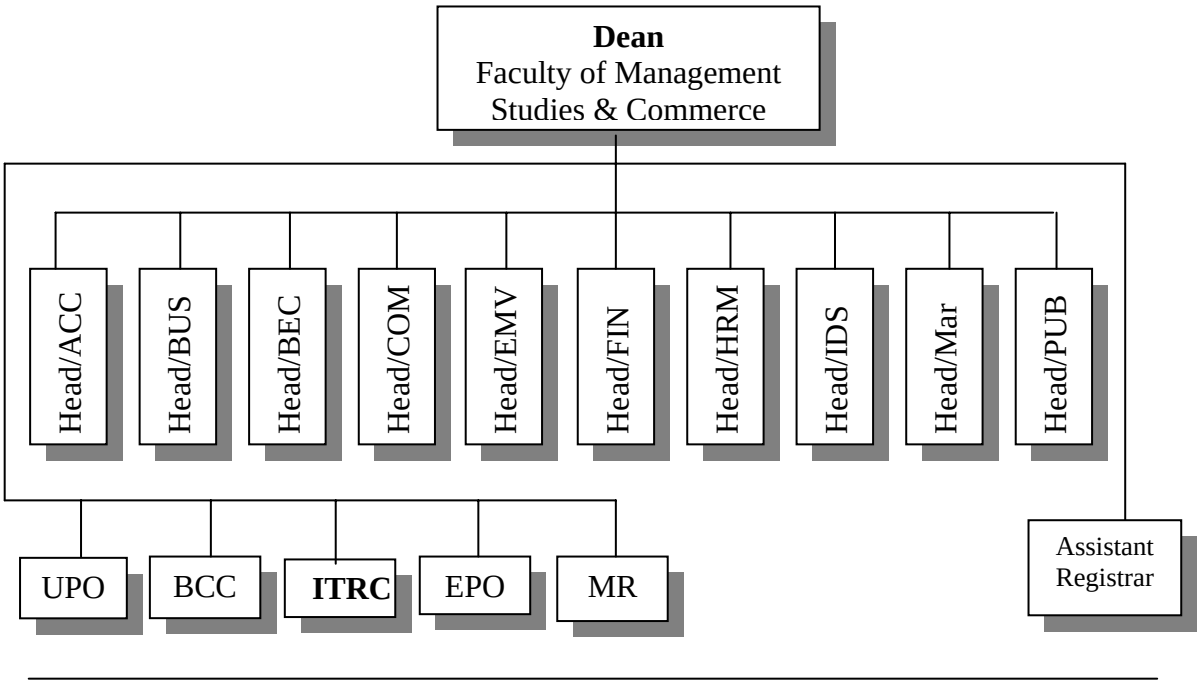
The advent of more stable Open Source LVCs and Commercial LVCs has made it possible to experience a more integrated, and collaborative feedback solution. The student satisfaction factors, and levels in such an environment can be explored further. In presently emerging web 2.0 technologies usage, collaboration has become a key note. A wiki, the concept made popular by Wikipedia can be used for collaboration among staff such as SME's, and can also be used to encourage asynchronous group work among students. The selected LMS of choice Moodle, is used in a large number of Educational Institutes (Moodle,2007), and is built around a social constructivist philosophy.

Moodle, however does not easily support organic growth of communities of practice except within a course-related metaphor. (Wise & Quealy, 2006). In comparison Social Network sites have seen a marked increase within the recent past. It maybe beneficial to analyse whether positives can be gained to study how a LMS such as Moodle can be developed to create a similar community of practice by the nature of their interactivity.

Studies further can be undertaken to investigate how mobile devices can be used, as an interaction tool within the learning environment, empowering students to join the interactive discussions. This is relevant as mobile devices become more prevalent in Sri Lankan Society and the connectivity speeds increasing with a parallel reduction in usage costs.

APPENDICES

Appendix A - Organisational Structure of the FMSC



Degree Programs offered by FMSC

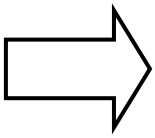
Academic Department	Degree
Accounting	B.Sc. Accounting (Sp.)
Business Administration	B.Sc. Business Administration (Sp.)
Business Economics	B.Sc. Business Economics (Sp.)
Commerce	B. Com (Sp.)
Estate Management and Valuation	B.Sc. Estate Management and Valuation (Sp.)
Finance	B.Sc. Business Administration (Finance) (Sp.),
Human Resource Management	B.Sc. Business Administration (Human Resource Management) (Sp.)
Information Technology and Decision Sciences	B.Sc. Business Administration (Information Systems) (Sp.)
Marketing Management	B.Sc. Business Administration (Marketing) (Sp.) degrees
Public Administration	B.Sc. Public Management (Sp.)

Appendix B - Structure of the Degree Programmes

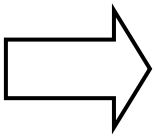
Year-1 Year- 2 | **Year - 3 Year - 4**

Specialization

Common Programme



- **B.Com. (Sp)**
- **B.Sc. Estate Management and Valuation (Sp)**
- **B.Sc. Public Management (Sp)**



- **B.Sc. Accountancy (Sp)**
- **B.Sc. Business Administration (Sp)**
- **B.Sc. Business Economics (Sp)**
- **B.Sc. Business Administration (Finance) (Sp)**
- **B.Sc. Business Administration (HRM) (Sp)**
- **B.Sc. Business Administration (Information Systems) (Sp)**
- **B.Sc. Business Administration (Marketing) (Sp)**

Appendix C – Key Items purchased by the ITRC: 2003-2005

1. Computers – 225
2. Laptop Computers – 02
3. Tablet PCs – 01
4. Servers- 04
5. Digital Still Camera – 01
6. Digital Video Camera – 01
7. Network Cameras – 02
8. Web Cameras – 13
9. Multimedia Projectors – 05
10. Printers – 13
11. Scanners – 03
12. Smart Card Reader - 01
13. Wireless Keyboards & Mice – 02
14. Barcode Readers - 02
15. Biometric Readers – 01
16. Wireless LANs
17. Audio Distribution System (Including Three Wireless Microphones, Matrix Switch, Amplifiers)

Approximate Cost of Specialist Equipment

1. Audio Distribution System : Rs. 350,000
2. Video Camera , Video Distribution Amplifier : Rs.150,000
3. Network Cameras (02) : Rs. 100,000
4. Miscellaneous (Software, Cabling etc) : Rs. 50,000
5. Server for LMS : Rs. 250,000

Appendix D – Proprietary & Open Source Learning Management Systems

Proprietary Learning Management Systems

1. ANGEL Learning http:// www.angellearning.com
2. Blackboard http:// www.blackboard.com
3. Class Campus http://www.classcampus.com
4. Desire2Learn http://www.desire2learn.com
5. eCollege http://www.ecollege.com
6. ePath Learning http://www.epathlearning.com
7. eWebUniversity http://www.ewebuniversity.com
8. Fronter http://fronter.info/com
9. GeoLearning http://www.geolearning.com
10. it's learning http://its-learning.com
11. IZIO http://www.izio.com
12. Knowledge Forum http://www.knowledgeforum.com
13. Learn.com http://www.learn.com
14. Meritscholar http://www.meritscholar.com
15. Opaltree http://www.opaltree.com
16. Oracle / PeopleSoft http://ilearning.oracle.com
17. Plateau http://www.plateau.com
18. SABA http://www.saba.com
19. SumTotal http://www.sumtotalsystems.com
20. The Learning Sphere http://www.thelearningsphere.com
21. Total LMS http://www.sumtotalsystems.com/products/stlms.html
22. WebCT (Brought by Blackboard, being phased out) http:// www.blackboard.com
23. Webstudy http://www.webstudy.com
24. WebTeach http://www.webteach.com.au
25. XplanaCourse http://www.xplana.com

Open Source Learning Management Systems

1. .LRN http://dotlrn.org
2. Atutor http://www.atutor.ca
3. Bodington http://www.bodington.org
4. Claroline http://www.claroline.net
5. ClassWeb http://classweb.ucla.edu
6. Colloquia http://www.colloquia.net
7. CoMentor http://comentor.hud.ac.uk
8. COSE http://www.staffs.ac.uk/cose
9. CourseWork http://aboutcoursework.Stanford.edu
10. DoceboLMS http://www.docebolms.org
11. Doekeos http://www.dokeos.com
12. eLecture http://physik.uni-graz.at/~cbl/electure
13. Eledge http://eledge.sourceforge.net
14. Ganesha http://www.anemalab.org
15. IILIAS http://www.ilias.de
16. KEWL.NextGen http://kngforge.uwc.ac.za
17. LON-CAPA http://www.lon-capa.org
18. maes3 http://sourceforge.net/projects/maes3
19. Manhattan Virtual Classroom 2.1 http://manhattan.sourceforge.net
20. MimerDesk http://www.mimerdesk.org
21. Moodle http://www.moodle.org
22. OLAT http://www.olat.org
23. OLMS http://www.psych.utah.edu
24. OpenCourse http://www.opencourse.net
25. OpenLCMS http://www.Sourceforge.net
26. OpenLMS http://openlms.sourceforge.net
27. OpenUSS http://openuss.sourceforge.net/openuss
28. Ripples/Manic http://manic.cs.umass.edu
29. Sakai Project http://sakaiproject.org
30. Segue http://segue.middlebury.edu/index.php?action=site&site=segue
31. Shadow net Workspace http://sns.internetschools.org
32. Whiteboard 1.0.2 http://Whiteboard.sourceforge.net

Appendix E – Live Virtual Classroom Software

1. Web Huddle https://www.webhuddle.com (Open Source)
2. Elluminate Live! http://www.elluminate.com
3. 3D4M http://www.3dsolve.com
4. Centra7 http://www.centra.com
5. Adobe Breeze http://www.adobe.com
6. HP Virtual Rooms http://www.hp.com/info/rooms
7. WebEx Training Center http://www.webex.com
8. Live Classroom http://www.horizonwimba.com
9. Microsoft Office Live Meeting
   www.microsoft.com/uc/livemeeting/default.mspx
10. IBM Lotus Virtual Classroom
    www-142.ibm.com/software/sw-lotus/lotus/offering7.nsf/wdocs/homepage

Appendix F –Authoring Tools

1. Macromedia Authorware , Director
2. Toolbook http://www.toolbook.com
3. MaxIT http://www.maxit.com
4. ReadyGo http://www.readygo.com
5. Atriculate http://www.articulate.com
6. Trivantis Lectora http://www.trivantis.com
7. Dynamic PowerTrainer http://www.dynamicpowertrainer.com
8. Reload http://www.reload.ac.uk
9. eXe project http://exelearning.org
10. Trainersoft

http://www.funeducation.com/products/trainersoft/trainersoft8.asp

Appendix G –Feedback form used for Evaluation

Evaluation of Teaching Effectiveness via Technology at the IT Resource Centre, Faculty of Management Studies & Commerce, University of Sri Jayewardenepura

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This questionnaire is given to you with the purpose of evaluating the effectiveness of the virtual learning environment developed at the ITRC. Your comments will be used to improve the service provided during computer practicals. Since the success of the evaluation depends on the accuracy of the information provided by you, you are kindly requested to be impartial and frank in filling this questionnaire. Do not write your name anywhere in the form.

Lasith Gunawardena, Department of IT & DS.

Instructions for responding to the questionnaire

Rate the respective performances using numerical scale by ticking (✓) the appropriate cage. Fill Section I & II based on whether you have participated in the live lecturer session and/or the remote location – where the lecturer is not physically present

Section I – If you have participated in the Direct (Face – to Face) Session with the lecturer

1. Explanations on Screen are understandable.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

2. The lecture is clearly audible

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

3. Multimedia based demonstration is clearly visible

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

4. The physical presence of the lecturer is important to me.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

5. My concentration during the lecture was steady.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

6. During the lecture session, I required the help and guidance of the Instructors

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

7. There were no technical difficulties (Using the Computer) that I faced during the lecture.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

8. Overall satisfaction of the lecture session is

Very Poor	Poor	Average	Good	Very Good

Section II – If you have participated in the Remote Session (Where the lecturer is not physically present)

9. Explanations on Screen are understandable.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

10. The lecture is clearly audible

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

11. Multimedia based demonstration is clearly visible

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

12. The physical presence of the lecturer is important to me.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

13. My concentration during the lecture was steady.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

14. During the lecture session, I required the help and guidance of the Instructors

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

15. There were no technical difficulties (Using the Computer) that I faced during the lecture.

Strongly Disagree	Disagree	Average	Agree	Strongly Agree

16. Overall satisfaction of the lecture session is

Very Poor	Poor	Average	Good	Very Good

Your Profile	(Tick ("✓") the appropriate box in Grey				
Gender		Male		Female	
Your English Knowledge		Good	Average	Poor	
Usage of Computers	Very Rare	Rare	Average	Frequent	Very Frequent

Write your comments on the Blended Learning system (Lecturer's Computer Desktop transmitted to a separate Lab with Audio & Video Support) used at the ITRC (Feel very free - Write your real feelings).

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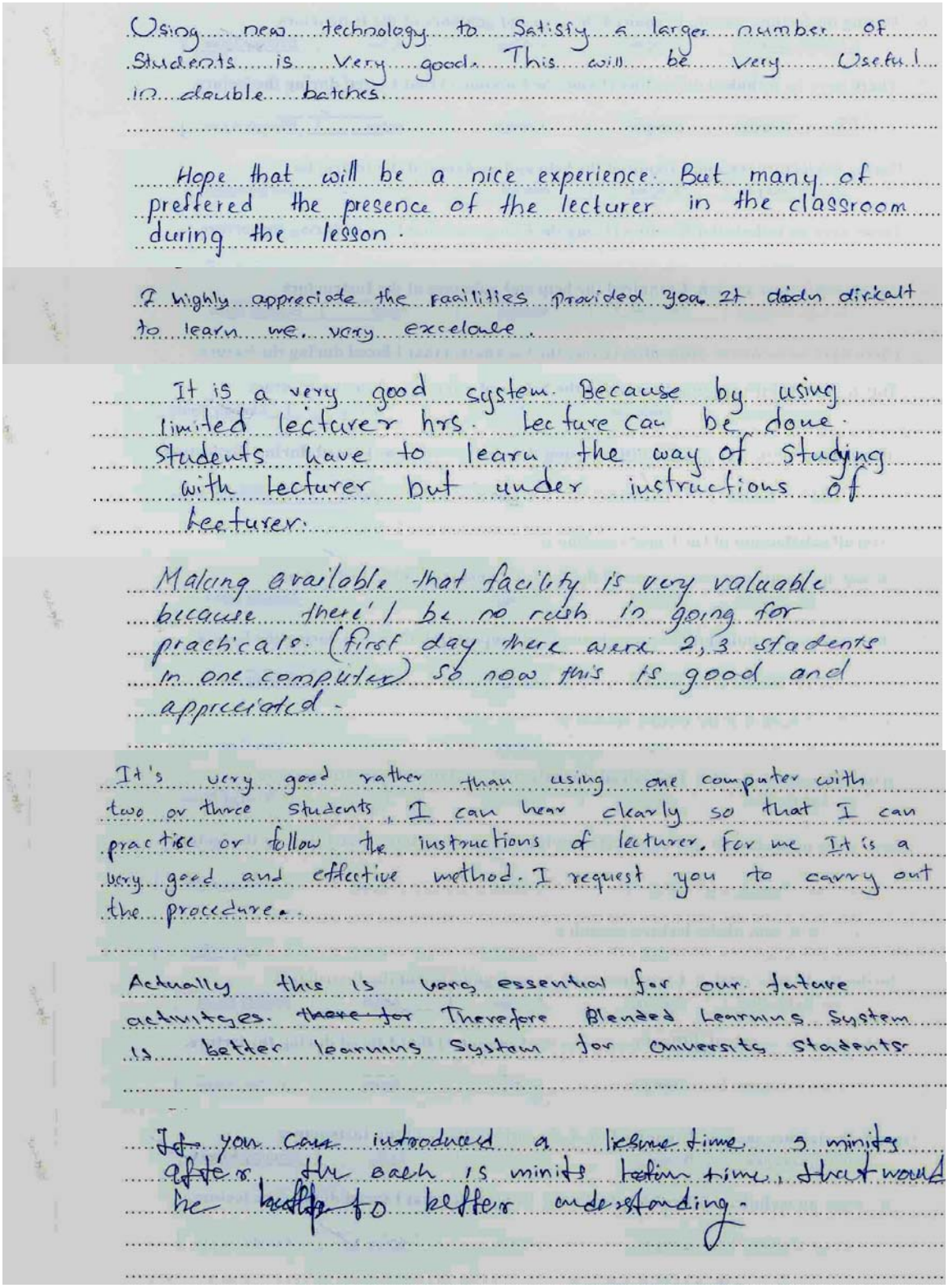
....Thank You....

Appendix H –Respondents (Selected) Comments to Open Ended Question



Using new technology to satisfy a larger number of students is very good. This will be very useful in double batches.

Hope that will be a nice experience. But many of preffered the presence of the lecturer in the classroom during the lesson.

I highly appreciate the facilities provided you. It didn difficult to learn we. very excelente.

It is a very good system. Because by using limited lecturer hrs. Lecture can be done. Students have to learn the way of studying with lecturer but under instructions of lecturer.

Making available that facility is very valuable because there'l be no rush in going for practicals. (first day there were 2, 3 students in one computer) so now this is good and appreciated.

It's very good rather than using one computer with two or three students. I can hear clearly so that I can practise or follow the instructions of lecturer. For me It is a very good and effective method. I request you to carry out the procedure.

Actually this is very essential for our future activitges. ~~there for~~ Therefore Blended Learning System is better learning System for University students.

~~If~~ you can introduced a lesson time 5 minits after the each is minits ~~before~~ time, that would be helpful for better understanding.

It seems to be a go practice and new experience to the students and as far as learning IT concerned for me the physical appearance of the lecture is immaterial.

lecturing via multimedia is very important. I think it is very effective.
but Our Some computers are not working & their not suitable for the IIRC. So please discharge those computers. & establish new computers.

Yeah its very normal and we feel free. Did not feel very different.

New experience

- Very good lectured and other lecturers.
- lecture program was very lasting finished
- Screen ~~is~~ isn't very clear. (small screen.)

Dear sir, I readily proud to say, studing here with several facilities. The system is appreciated but when lecture is in one lab ~~lab~~ other labs are need instructors. some time we face like this problem. Instructors are very important to every labs it will increase your effectiveness toomuch.

Thank you

Blended learning system may be free than present practice. But in our learning pattern we are wants to see the lecture during lecturing time. His physical appearance is also help to better way of learning.

it was not that bad but as a shudent I prefer the lechure to be in my Presense. that make me comfotable during the session as I can clarify any doubts as soon as it arise if he/she is in the Presence. but effort of IIRC is appreciatable to to accomadate every one for the same session.

feelings).

Actually we are used to learn with the lecturer. So in ē beginning it was bit diffuil to cope with it. But after a certain period of time it was OK. It is a productive way of teaching as well as learning.

I think physical presence of the lecturerer is very important to me. Always I try to see he/she when he/she is ~~disc~~ explaining something. But becase of large no of students, I think it can be very important to increasing of no. of demostrators.

When are directly interface with the lecturer if some points are not very clear we can stop the lecturer & can clarity. But in the web method it is very difficult to do so. Time for some times we miss some steps.

For ē students who are in ē last raws with ē lecturer can't see ē screen ∴ it is useful to sit in ē next lab (without lecturer) rather than sitting on last raws. Phisically ~~ap~~ present of ē lecturer is not important for me. But ē screen should be very very clear. ē support of ē instructors are important for me. Meanwhile some of ē computers are not working. ~~et~~ Those should be ~~repaid~~ repaired or replaced.

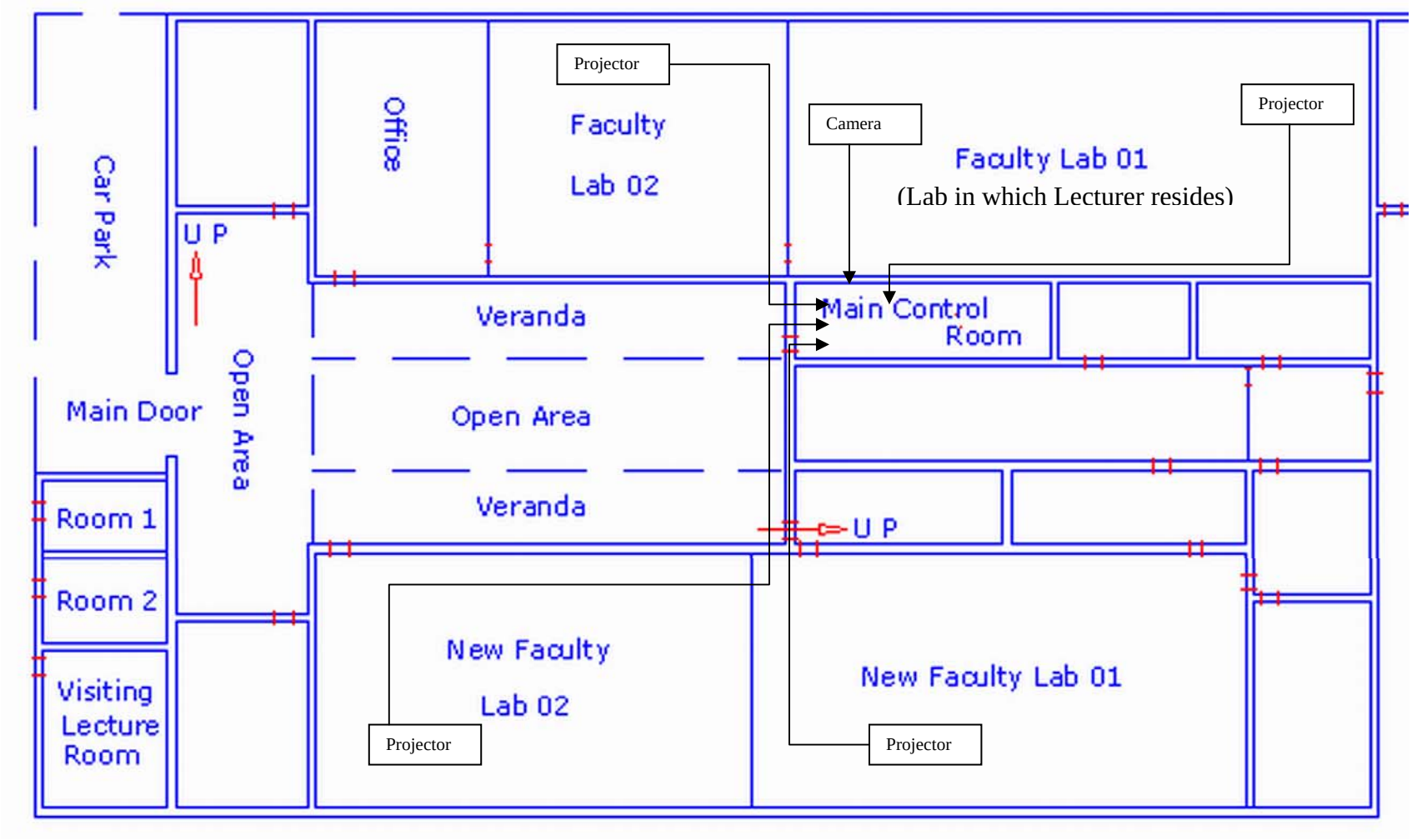
It may be a nice attempt to explore ē lecture for a vast no: of students. But as I feel there must be other helping teachers to clarify which are unable to catup by students at ē same time. Clear listening of ē student will help for ē success of your attempt.

separate Lab with Audio & Video Support) used at the FTKE (Feel very free to write your real feelings).

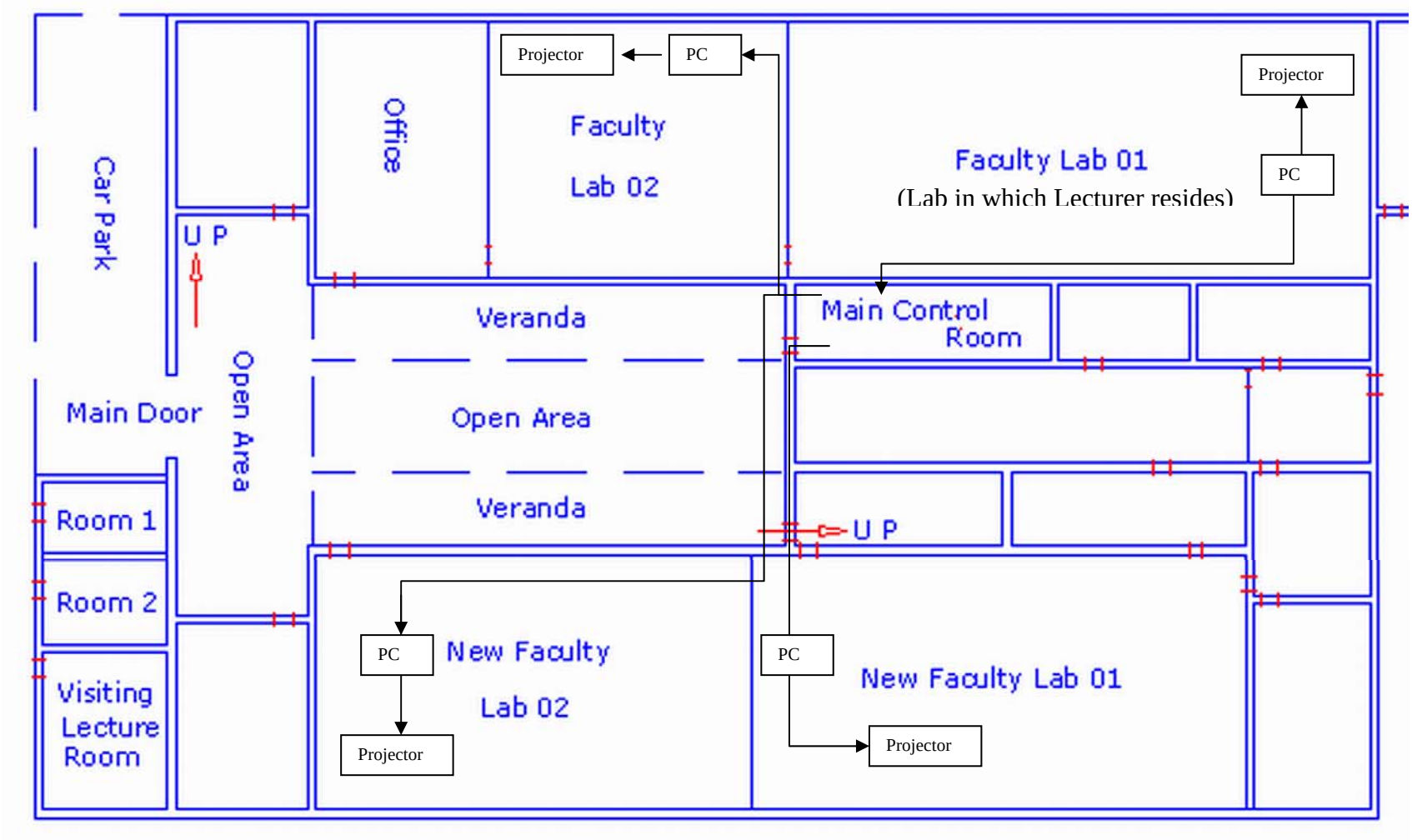
I have never been the hall where lecture is not visible. However I ~~h~~ find a place where the lecturer is Physically ~~n~~ visible because I ~~am~~ strong agree, without seeing the lecturer it is very difficult to concentrate on what he is teaching. Because as I thing all the students have used to that learning pattern. There should be a seperate lecturer for each and every hall. Transmitting the lecturer's appearance is not also not accepted.

Appendix I – System Configuration Plan

Video Distribution Diagram



Desktop (RGB) Distribution Diagram



Appendix J – Guidance Notes Issued to Lecturer, Student, and Instructor.

Form ITRC/O/17

Information Technology Resource Center (ITRC)
Faculty of Management Studies and Commerce
University of Sri Jayewardenepura
Intercom : 772/3 Web : www.itrc.info E-Mail: itrc@sjp.ac.lk, info@itrc.info

Virtual Learning Environment : Usage Guidelines for Lecturers & Instructors

1. The Infrastructure to facilitate this environment is currently setup to accommodate the lecturer in Lab1.
2. Before starting the class, please ensure that there are at least two instructors in each computer laboratory.
3. It is beneficial if the Instructors are made aware of the session objectives in advanced by the lecturer.
4. It is beneficial if the students are provided with the necessary printed notes pertaining to the study exercise.
5. A Duty officer will be at the ITRC to assist you in this session for technical problems. Please seek his/her assistance when required.
6. In order for the students in the remote classrooms to properly listed, the Wireless Microphone must be used. The lecturer has the option of using the Clip on Microphone or the headset type microphone. Before starting the lecture proper, please ensure that the voice level is at the appropriate level.
7. Since the projection system does not have a facility to project the whiteboard clearly, all denotations must be done on computer desktop. The video projection is provided only as a facility to track the lecturer. It is also important to stay at the front desk with the lecturer machine (Numbered Lec1,Lec2…..) when addressing the students.
8. You can view the progress of the remote classrooms by using the Network Cameras installed at the ITRC. To access these you may click on the home page of the Web Browser and Select Network Cameras. (Or type lab3cam.net, lab4cam.net etc)

9. The net meeting interface is setup to connect the remote lab instructor(s) with the local session. Please observe this window of the Inet Computer to check on any student problems voiced.
10. Please ensure that the students in the remote classroom are regularly addresses to provide a confidence to them that the lecturer is addressing them as well.
11. The Net Support Software Installed, can be utilised to monitor each student desktop from the lecturer position itself.
12. After the completion of each subtopic within the day's lecture, or once the students have been given a task to complete on their own, you may visit the remote classes as well. The wireless microphone you use will work in the remote locations as well. Please contact the duty officer if you need any assistance to switch the voice properly.
13. The last 15 Minutes are best utilised to address student problems, and in each of the classrooms, wireless microphones can be made use to allow student to address the lecturer. This process must be regulated by the instructors in the remote labs, and the opportunity must be given to a single lab at a time.
14. Instructors in the remote classes are advised to monitor the class at all times, and use the net meeting interface to connect up with the lecturer when required.

Form ITRC/O/17

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Virtual Learning Environment : Usage Guidelines for Students

1. This System is provided with a view to maximise the teaching resource utilisation. Your cooperation and positive feedback will enable us to make this a success.
2. The system is designed with the student in view and the ITRC strives to make this a productive and fulfilling experience as much as possible.
3. You are free to sit in either the direct classroom where the lecturer is present, or the remote classroom, on a first come first serve basis.
4. The Classroom will have two screens, one for the lecturer's view and one for the Desktop Demonstration. The lecturer's voice will be carried through by the built in Sound System. If the second projector is unavailable due to unforeseen circumstances, the instructors in the remote classroom will be switching the projector from the desktop to the lecturer view as and when required.
5. Please request the assistance of the instructor in class when required.
6. The ITRC has a Learning Management System (LMS) installed to assist you in this process. This will carry out instructions, and replay's of classroom activities. Please solicit the assistance of the instructor to get the login to access the system and use it.
7. During the last 15 minutes, you will have an opportunity to ask questions from the lecturer. In addition the lecturer will visit the remote classrooms to check on your progress.

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