Critical Success Factors on E-Resource Based Learning: a case study

by

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Abstract

E-Resources, one of the tools emerged from the development of ICT, have helped users in retrieving accurate, relevant and timely information as and when required for their learning, teaching and research needs. Therefore, University Libraries are in the process of acquiring, renewing, promoting and giving access to e-resources since the mission of the university library is to meet the information needs of their faculties, students and affiliated effectively and efficiently. However, according to previous studies and observations, the utilization of e-resources available in the University of Colombo library is not in a satisfactory level. To verify this observation and to find out factors affecting e-resource usage, it was decided to carry out an empirical study on the Critical Success Factors on e-resource based learning. The main objective of the study was to investigate the CSFs affecting e-resource based learning on user and manager perceptions. Further the study attempted to explore the usage of e-resource categories by different user groups, methods used to learn about e-resources, places of access and difficulties in using e-resources. The three major user categories; undergraduates, postgraduates and academic staff, of the library of University of Colombo were selected as the user population while professional library staff was included as the e-resource managers. The research sample consisted of 367 undergraduates, 302 postgraduates, 205 academic staff, representing user population and the Librarian of the University of Colombo and two Assistant Librarians, representing e-resource managers. Stratified Random Sampling Method was utilized to determine the sample size of the user population and Purposive Sampling Method was used to select the sample from e-resource managers. Questionnaires and interviews were the main research tools for the study. Questionnaires were used to gather data from users while interviews were used to collect information from librarians. An intensive literature survey and a focus group discussion were conducted in prior to questionnaire development. The response rate of the user survey was 78% and 100% of the interviews. The results emphasised that more than 90% of respondents used e-resources for academic and research purposes. All three user categories identified Usefulness, Computer competency, Information literacy, User attitudes and Technology as CSFs on e-resource based learning. Apart from the above five CSFs, undergraduates perceived that Lecturer characteristics was also a CSF for them to use e-resources where as postgraduates and academic staff identified Library support. Results also revealed that Internet was the most frequently used e-resource type by all users. Majority of users were self learners of e-resources by reading manuals and help options and more than 50% accessed e-

resources within the University premises. Lack of computers, low internet connection speed, less reliable network and lack of training and awareness were among common problems in e-resource usage. Further, e-resource managers identified six CSFs on e-resource based learning which includes, Funds, Staff development, User training, Promotion, Technical issues and Faculty-Library collaboration. Therefore, the university administration and the Library should play a proactive role in maintaining and improving CSFs on e-resource based learning and should take the advantage of e-resources in university education by overcoming the problems in its usage. The study made recommendations to improve e-resource based learning by providing more facilities through developing IT infrastructure, organizing more training and awareness programs, enhancing Faculty-Library collaboration to strengthen e-resources usage and exploring new funding sources to acquire more e-resources.

Chapter 1

Introduction

Information and Communication Technology (ICT) has shown major advancement in the globalized 21st century, reshaping not only society, but also education. Conventional university education is limited to the classrooms and libraries (which are physical entities), deal primarily with physical materials such as printed books, hard copy journals, and the like.

With the changes in technology, information materials have also varied from its very basic nature to digital formats of the modern world. According to Seneviratne (2003),

> "it starts in the form of its very basic nature (a) printed form. Then development of which proceeded with the progress of photography (b) Micro Media, with the development of wireless radio and television technology, (c) Audio-visual form, with the digital revolution (d) Electronic form and the web technology and development of markup languages (e) online accessible form" (p.86).

The computer, after its invention, is used in information handling, education and research, like in all other fields. Computer learning can be achieved by using particular software stored in the hard disk, a floppy disk or in a compact disc. Even a stand-alone computer provides many facilities to carry out technical work. The revolution started with the introduction of network systems. Networked computers provide an unparalleled capacity to access and manage large amount of information (Volery & Lord, 2000). It also provides the ability to communicate with computers which are many miles apart.

Electronic information resources (e-resources), which are accessible via computer networks or stand-alone computers with a connected device such as CD-ROM drive, are now recognized as being vitally important for academic libraries. According to Hogan (2001), an exponential growth of scholarly information was observed due to a rapid change in the global economy and expansion of new technology. This development has revolutionized information access and use. As a result of the change in scholarly communication, academic libraries have now begun to provide e-resources and services to their users.

1.1 Conceptual Background

E-Resources are invaluable information materials which complement print-based resources in any traditional library. They have exploded in popularity and usage and enables innovation in teaching and learning. As described by Renwick (2005) "e-resources increase timeliness in research as well as increase discovery and creation of new field of inquiry" (p.21).

The commonly available e-resources include e-journals, e-books, online databases, CD-ROM and OPACs. Although e-resources have been grouped into different categories by different authors, depending on format, functions, delivery method, content and subject coverage, some of them do not fall neatly into one category. According to Damayanthi (2006), the amount of information content in an electronic format is growing and conversion of print and other forms of information to electronic forms have already brought about significant changes in the nature and categorization of e-resources.

In the past few years, one of the major developments in the libraries is the acquisition and spread of e-resources and services to their patrons. According to Armstrong and Lonsdale (2007), libraries have concentrated on bibliographic control, rights issues, licensing, archiving, monitoring and evaluating the use and information literacy skills, when managing e-resource collections. Moreover, e-resources are unique when compared to the conventional information materials as they require appropriate computer hardware, software and other related equipments, which need to access quality and ease of the user interface. A number of studies have shown that basic information and computer skills play an important role in using e-resources. As stated by Damayanthi (2006),

> "It is essential that adequate user knowledge and skills for user to interact with and manipulate the hardware, software and the different e-resources as well as to identify and define their needs in electronic environment" (p.15.)

Therefore, libraries are responsible in providing the necessary tools as well as the skills needed to interact with e-resources.

E-Resources gained popularity among students, academics and researchers due to the easy access of information over 24 hour period either from the library, faculty, Internet cafe, office or at home. They provide access to information that might be restricted in its use because of geographical location and finance. They also provide access to current

information as these are often updated frequently. E-Resources provide extensive links and related content to explore additional resources through various search techniques. Researchers highly appreciate the interactive facilities available with e-resources such as e-mailing, online help, ask librarian or blogs. Value added features of e-resources which include, multimedia hot links, customized personal information filters, e-mail alerts, copyright protection, electronic payments, access to archives and Really Simple Syndication (RSS) feeds also provide vast amount of benefits to the users and make information access easier.

The availability of e-resources accessed from the Internet, the Web or the other forms of electronic storage is widely viewed as a significant feature of the contemporary education. As described by McDowell (2002)

> "The fast growing array of electronic information resources is often viewed as a significant opportunity for change in education with shifts towards increased student independence in learning"(p.255).

Education in the 21st century is increasingly becoming more and more competitive. Changes in the global economy and advancement in Information and Communication Technology have a big impact on education; specifically on higher education. This globalization and technological development influenced several expectations in the sphere of education such as lifelong learning, distance education and e-learning. All these changes have emphasized one important fact; learners are becoming more and more independent and influence self learning. According to McDowell (2002), accessing and using information resources is one of the ways in which students begin to act as independent learners, become involved in making choices, weighing evidence and coming to conclusion by themselves. A number of educators believe that new opportunities for electronic information access will promote and accelerate this process.

As described by Kozma (1991), learning is an active, constructive process whereby the learner strategically manages the available cognitive resources to create new knowledge by extracting information from the environment and integrating it with information already stored in memory. The process is also sensitive to characteristics of the external environment, such as the availability of specific information at a given moment, the duration

of that availability, the way the information is structured, and the ease with which it can be searched. In that sense, e-resources enhance the processes of learning by providing easy access to current information whenever learners need it. The different categories of e-resources are able to provide well structured information within a few minutes and the value added features provide necessary interaction to the learner.

The rapid expansion of the Internet as a potential course delivery platform has developed online programs which are commonly named as e-learning or online education (Volery & Lord, 2000). E-Learning is considered as the highest achievement of using Information and Communication Technology in education. Some Educators viewed it as a recent evolution of distance education as it provides more active and synchronous learning by using a two-way interactive technology (Choi *et al,* 2007). It is also viewed as having the potential to improve the quality of learning, improve access to education, reduce the cost of education and improve the cost effectiveness of education (Gilbert *et al,* 2007). Today, most of the Universities have developed online programs as an answer to budget restrictions and an increasing interest in lifelong learning. E-Learning provides access to learning resources, communication facilities, assessment facilities and administrative and student support in a virtual learning environment.

Information Technology (IT) in teaching and learning has created a transformation on learning process of university students by using more modern, efficient and effective alternatives such as e-resources and e-learning. This transformation is possible with high computer literate student population in present day universities. According to Biddiscombe (2002),

> "with an increasingly computer literate population and the vast majority of students now having basic computer skills when they arrive at universities, new ways of teaching and learning become possible" (p.229).

Thus, there has been a considerable interest in understanding the factors affecting the use of new information media and technology in learning activities. As a result, e-resources usage and e-learning has attracted considerable research and development funding and commercial interest. Several studies have used concepts such as Critical Success Factor (CSF) to identify those affecting technology based learning. Initially, the concept of CSF was developed with

the managerial sector, now it is being widely used in understanding success factors in information technology applications. Therefore, the present study uses a concept of CSF to identify the factors which affect e-resource based learning in the Sri Lankan Universities using University of Colombo as the case.

1.2 Contextual Background

The higher education system in Sri Lanka is a three-tier system which consists of public universities, public advanced technical institutions and private post secondary institutions (Chandrasiri, 2003). Among them, public universities are considered as the leading organizations in the higher education sector. The Sri Lankan university system began in 1921 with the establishment of University College at Colombo, as part of the University of London's overseas academic network (De Silva, & Peiris, 1995). This was not an autonomous institution like a university. The University of Ceylon was established in 1942 by amalgamating the University College and the Medical College as the second stage in the university development. Beginning with a single university in 1942, the university system in Sri Lanka has now grown to comprise 15 universities operating under the primary legislative enactment, the Universities Act, No. 16 of 1978. At the apex of this system is the University Grants Commission (UGC) which is responsible for the planning and coordination of university education, allocation of public funds for higher education institutions, maintenance of academic standards and regulation of admissions to the higher education institutions.

Since higher education is becoming increasingly important for Sri Lankan students, there is a growing universe of public and private institutions outside of the conventional universities that award certificates, diplomas, and degrees at a tertiary level. The conventional universities still nationally award almost all the degrees. Admission to universities is a rare opportunity and extremely competitive in Sri Lanka. Only 14.34% of the students who sat for the Advanced Level examination in 2006 are eligible to enter the university stream (Sri Lanka University Statistics, 2007). Insufficient opportunities for higher education are considered as a serious economic, social and political problem in the country. Distance education and external degree programs conducted by some of the universities attempt to give some relief to the students.

To improve the distance learning programs and to improve quality of current degree programs, the Sri Lankan government has allocated millions of funds for the development of IT infrastructure and education within universities. As a result, all the Sri Lankan universities are been connected to the Internet through the Lanka Educational Academic and Research Network (LEARN). LEARN is considered as the national network interconnecting computers in academic and research development institutions across the country and provides Internet access since 1990 through leased and dial-up lines (Senevirathne, 2003). The universities connected to the Internet have already exploited its facilities to the public via institutional websites. University staff and students are benefiting in terms of their information and communication needs without any cost. Today, Internet connectivity and IT facilities support the entire range of teaching, learning and research activities of the universities with computing facilities, video-based education, e-resources, Internet and Communication Technology.

Out of fifteen state universities, University of Colombo is considered as the most reputed university in the country. The history of the university is closely linked to higher education in Sri Lanka which traces its beginnings to the establishment of the Ceylon Medical School over 115 years ago. The first University collage was established in 1921 in the location where the University of Colombo exists today. Since the University collage was not an autonomous institute, the University of Ceylon was established in-situ in 1942, though it was moved to the site of the Peradeniya, the medical faculty and the college house remained as the Colombo Campus under the main University in Peradeniya. The Colombo Campus acquired its present name and became the University of Colombo in 1978 by the Universities Act of 1978.

The University of Colombo today has seven Faculties with forty one Academic Departments, a Campus, a School, six Institutes and five Centers. The seven faculties include the Faculty of Arts, Education, Law, Management and Finance, Medicine, Science and Graduate Studies. The Medical and Science Faculties of the University are not only the oldest in the university system of Sri Lanka, but are also arguably the best in terms of faculty and resources. The Faculty of Arts is the largest in the University of Colombo in terms of student enrolment. The University of Colombo has a total student population of approximately 12358 in the year 2008, of which about 9728 students follow undergraduate degree courses. The balance 2630

follows various postgraduate study courses in different Faculties (Sri Lanka University Statistics, 2007).

The University of Colombo, being a leading university in Sri Lanka, provides facilities to improve IT education and enhance the use of electronic resources in education. At present the University provides the Internet facilities to its staff and students via connection to LEARN since the early 1990s. Two leased lines (64Mbps – 1Gbps) from LEARN interconnect the University of Colombo campus-wide network with the Internet. All the faculties in the University have well equipped computer laboratories with internet connection and provide modern information and communication facilities for their students. A majority of the Departments maintain their own websites which connect to the University website to exchange information with students and the external environment.

The University Library is acting as the focal point in acquiring, managing and giving access to e-resources. The library system of the university consists of the Central Library and two faculty libraries: Medicine and Science. The Central Library is situated in a five storied building which contains books, periodicals and e-resources in Humanities, Education, Law, Management and Social Sciences. The Medical Library and Science Library serve their faculties and are fully automated, while the Central Library functions as a semi-automated library and is planning to have fully automated functions very soon. All three libraries have e-resource centres with Internet facilities to access Internet and other e-resources. Further, a well equipped seminar room in the Central Library provides facilities to carryout training programs and hands-on workshops to the students and staff.

The library website acts as the access gateway to all e-resources available for library users. It provides access to a library catalogue through an Open Public Access Catalogue (OPAC). It gives access to all e-journals and databases subscribed by the University Library. Users can access free e-books and subject gateways as it provides relevant links. Another attractive feature is giving access to newspapers, all government websites and other related sites. Library website also acts as an active learning space where students and staff can interact. Further, it provides e-mail links for users inquiries through an ‘Ask a librarian’ service.

It is worth mentioning that the Library of the University of Colombo has acquired from 2003 to 2007, university wide access to several large online full-text electronic databases through International Network for the Availability of Scientific Publication (INASP) and a Program for the Enhancement of Research Information (PERI) with the financial assistance of the Swedish International Development Agency (SIDA). Several thousand peer reviewed full-text periodicals from different publishers and databases such as Blackwell Publishers, EBSCO Host, Mary Ann Liebert, Wiley, American Society of Agricultural & Biological Engineering, CABI Global Health and World Bank Publications were available for the use of the university academics, students and staff. Since the project concluded in 2007, SIDA has agreed to provide unused allocations over the past five years, to subscribe electronic databases such as Blackwell Publishers, EBSCO Host, HW Wilson and Sage publications in the year 2008. Other than that, the University subscribes JSTOR with the aid of Ford Foundation, EMERALD and Hein Online using treasury funds allocated to the Library.

User education and training on e-resources is another major area that library considers on. In that sense the central library occasionally arranges three types of training programs for university students, researches and academics. Out of which, the orientation programs conducted for new comers, gives an introductory training on library services and using library website. Hands-on workshops to educate the library patrons in the field of e-resources and e-access are conducted for small groups of about 20 participants from a particular department of the university. The bulk sessions including formal lectures and buzz group interactive gatherings are organized on demand from the university department.

As other academic libraries in Sri Lanka, the library of the University of Colombo also provides better service to its users by acquiring e-resources, giving access to them and providing training to ensure the maximum utilization of these resources. All these efforts are targeted to improve the quality of university education, hence to achieve the university mission;

> "to be a centre of excellence in teaching and research, with commitment to producing human talents of high standards and social responsibility who are innovative with independent thinking and analytical skills contributing to national development".

1.3 Statement of the Problem

One of the major developments in libraries and information system in the past few years was the advent and spread of e-resources and services. Several university libraries including the University of Colombo have initiated, and some of those have successfully established e-resource services for their users. The university community makes use of those resources for their teaching, learning and research purposes. However, the usage of these resources and services are not up to a satisfactory level due to several issues. According to Damayanthi (2006) users were not satisfied with the e-information services offered by the libraries of University of Peradeniya and strongly believe that currently available e-resources were not properly utilized due to problems such as lack of computers, lack of guidance technical difficulties and lack of awareness.

Within such an environment, the University of Colombo tries to fulfill the need to access current technology and the use of IT for education. According to the University Annual Reports from the year 2002 to 2005, the University has allocated millions of funds for the development of IT education, as well as to buildup the infrastructure which supports IT education. In the mean time, the University has to increase the percentage of their annual budget on expanding IT infrastructure, maintenance and to provide internet facilities to the users. The Library of the University subscribes several full-text e-journals and databases from reputed publishers with the assistance of several foreign agencies such as SIDA. These subscriptions spend around twenty million Sri Lankan Rupees per year and the subscription rates increase annually. Though university administration and the library are in the process of improving e-resource usage a satisfactory level, it has not been achieved so far, as evidenced by previous surveys (Wijayasundara, 2004) and user statistics of the e-resource center of the main library. All these facts proved that there are problems in user perceptions, their attitudes and behavior on electronic environment which should be investigated in order to improve e-resource usage. It is important, therefore, to explore factors which influence e-resource usage as well as inhibit its use. The increased expenditure on IT education and unsatisfactory e-resource usage has heightened interest to identify factors which make e-resource based education a success.

1.4 Purpose of the Study

The Aim:

The aim of the study is to investigate the Critical Success Factors on e-Resource based learning of the University of Colombo so as to enable the University authority to provide appropriate facilities and services for the students.

Objectives:

1. To find out factors affecting e-resources usage, e-learning and e-resource based learning from previous related literature.
2. To find out suitability of these factors, extracted from previous literature in the Sri Lankan context.
3. To explore Critical Success Factors (CSFs) on e-resource based learning on user perceptions (undergraduates, postgraduates and academic staff) of the University of Colombo.
4. To find out the impact of these CSFs on e-resource usage and rank them based on their criticality.
5. To explore CSFs on e-resource based learning on e-resource manager perceptions
6. To find out the usage of different e-resource categories by different user groups at the University of Colombo.
7. To investigate the problems associated with e-resource based learning.

1.5 Research Questions

Objective	Research Question	Method/s
Objective 1.	1. What are the factors, discovered by previous studies which affect e-resource usage, e-learning and e-resource based learning?	Literature review
Objective 2.	1. Of the discovered factors, what can be applied to the University of Colombo?	Focus group discussion
Objective 3.	1. What are the CSFs, affecting e-resource based learning of the undergraduates? 2. What are the CSFs, affecting e-resource based learning of the postgraduates? 3. What are the CSFs, affecting e-resource based learning of the academic staff?	User survey using questionnaires and Factor Analysis
Objective 4.	1. What is the order of CSFs depending on their criticality for undergraduates? 2. What is the order of the CSF depending on their criticality for postgraduates? 3. What is the order of the CSF depending on their criticality for academic staff?	User survey using questionnaires and Multiple Regression Analysis
Objective 5.	1. What are the CSFs on e-resource based learning of e-resource managers	Interview
Objective 6.	1. What is the usage of e-resource categories available in the University of Colombo? 2. Is there any difference in e-resource usage between user categories, faculties, age groups and medium of the degree program?	User survey using questionnaires and One Way ANOVA
Objective 7.	1. What are the problems associated with e-resource based learning?	User survey using questionnaires

1.6 Limitations and Delimitations

Limitations and delimitations are an integral part of the study, hence they can affect the research design and outcomes.

1.6.1 Limitations

The factors, which are beyond the control of the researcher that can affect the research outcomes, are as follows:

- Collection of data from all the respondents in the sample was not possible due to lack of interest in filling the questionnaire and lack of experience in e-resource usage.
- The users would have found it difficult in accessing e-resources and sometimes it would have been a frustrating experience due to technical problems of the network. Slow speed and continuous disconnection are some of the problems faced by the users, which would have ultimately hindered users in accessing e-resources.
- Most of the e-resources are in English medium. As some users are not conversant in English, they would have not made full use of the e-resources.
- Some users would not be aware of available e-resources and poor utilization could be attributed in this fact.
- The questionnaires used in this study were mainly constructed to get responses on qualitative aspects of various variables, such as perceptions and attitudes hence respondents would have felt difficult to measure their own attitudes and differentiate from the rest.

1.6.2 Delimitations

The factors, which are under the control of the researcher, that affect the research outcomes are discussed as follows:

- The study was carried out as a case study in the University of Colombo. Therefore results of this study cannot be generalized to the whole University sector.
- The study was confined to the seven major faculties of the University. The campuses, institutes and centers governed under the University of Colombo were excluded from the study.
- First year students were excluded from the study, since they have less awareness and lack of experience about the library services.
- Users who are using e-resources for academic purposes were only selected for the research as the study focused on Critical Success Factors affecting e-resource based learning.

1.7 Significance of the Study

Sri Lankan Universities, like all other Universities in the world, plan to develop university education with the potential of Information Technology. Presently all 15 Universities in Sri Lanka spend their budgetary allocations to improve the facilities that require a new paradigm in education. As any other technological application, the successful usage of e-resources will depend on user acceptance and adaptation of e-resources. It is important to investigate the factors affecting the use of e-resources for learning and teaching activities in universities. The Critical Success Factor technique is used by different researchers to find out the factors affecting success usage of several IT applications. These factors can be social, cultural, individual or organizational and should receive careful and constant attention.

The University of Colombo has increased its budget allocation to provide e-resources for students and staff over the last five years. The university is also planning to establish an e-learning system for undergraduate in all faculties by 2010 in attempts to approach the target by;

1. Providing computer and internet facilities to all members of the academic staff.
2. Developing, promoting and using e-learning material for selected subjects on an annual basis
3. Increasing computer facilities for undergraduate students

4. Designing external degree programs through mass media and the internet
5. Upgrading electronic resources of the library with the ultimate of creating a virtual library (Corporate Plan 2006-2010).

Even though the University is planning to develop an e-learning system, no survey has been conducted to determine the usage of currently provided e-resources or the factors that affect successful e-resource based learning. If the University wants to make the utmost use of e-resources, it is essential to identify the key success factors affecting e-resources usage. This study aims to identify the key success factors of this new paradigm of education based on a case study done at the University of Colombo.

There were few studies based on e-resources and Internet usage in universities; but no study has been done to identify critical success factors on e- resource based learning in Sri Lanka. The result of this study will provide factors which affect e-resource based learning. These factors will help the university authority to plan future e-learning systems and to develop IT education and infrastructure. The Library will be able to use these factors to get better decision in subscribing e-resources and in planning training programs. Moreover by identifying these factors and developing them in a user accepted and apposite way, the e-resources services can be managed healthier in strengthening its quality of service particularly through application of user perceptions.

1.8 Operational Definitions

Academic Library
A library that is an integral part of a college, university or other institute of postsecondary education, administered to meet the information and research needs of its students, faculty and staff (Reitz, 2004)

Database
A large, regularly updated file of digitized information (bibliographic records, abstracts, full-text documents, directory entries, etc.) related to a specific subject or field, consisting of records of uniform format organized for ease and speed of retrieval and managed with the aid of data management system software (Reitz, 2004).

E-Learning
E-learning is learning that takes place in the context of using the internet and associated web-based applications as the delivery medium for learning experience (e-Learning Advisory Group, 2002)

E-Journals
A digital version of a print journal made available via the web, e-mail or other means of Internet access (Reitz, 2004).

E-Resources
E-resources are materials consisting of data and/or computer program(s) encoded for reading and manipulation by a computer or by using a peripheral device directly connected to the computer, such as a CD-ROM drive, or remotely via a network, such as the Internet (Reitz, 2004)

E-Resource based learning
Using e-resources for academic and research purposes.

User
Persons who uses, the e-resources and services of a library. Not necessarily a library visitor, but can be a person who have remote access.

1.9 Summary

The chapter presented an introduction to the study under several subtopics. First, the conceptual background was discussed, stressing the important concepts used in the study. The contextual background presented the history of tertiary education in Sri Lanka, IT education at the University of Colombo and the Library system. The chapter also stated the problem of the study, followed by its aims and objectives. The purpose of the study was to investigate the CSFs on e-resource based learning and to enable the university authority to provide facilities for students. The limitations and delimitations of the study were discussed since they may affect the research outcomes. Finally, the chapter presented the importance and significance of the research study to the University of Colombo.

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Chapter 2

Conceptual Review

2.1 Introduction

The form and structure of teaching and learning has been changing due to the rapid advancement in Information and Communication Technology (ICT). Today, students have access to vast amounts of information through a variety of sources in different formats. Among them, e-resources have received greater attention as they enhanced the learning process by providing current information by allowing an interactive communication medium. As a result, a large and growing body of literature exists on various aspects of e-resources and using e-resources in teaching and learning. Since the current study is on exploration of Critical Success Factors on e-resource based learning, this chapter presents a review of related literature on concepts, theories and models underpinning this study. The chapter presents the evolution of e-resources and definitions used in previous studies followed by different categories, management and potential benefits of e-resources. The Internet is discussed as its main gateway. Potential avenues of using e-resources in learning process are discussed as e-resources based learning. It presents what is e-learning and the relationship between e-resources based learning and e-learning. The chapter then examines the concept of Critical Success Factors (CSFs) and its applications. Further, it presents theories of technology acceptance and adaptation as the foundation of understanding human psychology and behaviors, which are to be med in investigating psychological factors contributing to the success of e-resource based learning.

2.2 Defining E-Resource

Electronic resources (e-resources) are invaluable information sources that provide access to information that might be restricted to the user because of geographical location or finance. It offers exciting new opportunities:

> "Because of the speed of data processing, the storage capacity of computers and instant accessibility of electronically transmitted data, we now live in a global capsule with the world at our fingertips, no more than a few clicks of a mouse away" (La Velle & Nichol, 2000, p. 99).

In the early 1970's, information economics contributed the argument for treating information as a resource (Trauth, 1989). Since then information has become an important component of the economy. With the development of computers and communication technology, electronic formats of information began to rise overcoming all the other information products. One of the major developments in libraries and information systems in the past fifteen years was the advent and spread of e-resources, services and networks (Kebede, 2002). Kebede (2000) also stated that, the change is basically of physical form where information content is being captured, processed, stored and disseminated in an electronic form. Today, small inexpensive and easy to use information technology is embodied in the personal computer and is accessible to everyone.

Different people may have different impression or understanding of the term e-resources. According to the Online Dictionary of Library and Information Science by Reitz (2004), e-resources are materials consisting of data and/or computer program(s) encoded for reading and manipulation by a computer or by using a peripheral device directly connected to the computer, such as a CD-ROM drive, or remotely via a network, such as the Internet. The category includes software applications, electronic texts, bibliographic databases, institutional repositories, Web sites, e-books, collections of e-journals, etc. Electronic resources not publicly available free of charge usually require licensing and authentication.

Although there are enough definitions for different categories of e-resources, such as e-journals, e-books and bibliographic databases, e-resource was not defined in most of the literature. Ashcrof and Langdon (1999) used a wide definition for e-journal,

> "a journal, including indexing and abstracting services, provided by any electronic means, (Internet or CD-ROM) although not necessarily exclusively by electronic means" (p. 105).

The general meaning of an e-journal is a digital version of a print journal, or a journal like an electronic publication with no print counterpart made available via the Web, e-mail, or other means of Internet access (Reitz, 2004). E-Books were defined as a digital version of a traditional print book designed for reading on a personal computer or an e-book reader (a software application for use on a standard-sized or a book-sized computer used solely as a

reading device). Other than e-journals and e-books, numerous types of e-resources are available today as information sources.

2.2.1 Categories of E-Resources

In order to have an overview of e-resources, it was necessary to consider different categories of e-resources available today. It is apparent that categorization and definition of these categories would be difficult and whatever the categorization, some resources would not fall neatly in to one category (Armstrong *et al*, 2001). For example, electronic document delivery services, full-text databases and electronic journals all deliver the same product that is, full-text of articles. However, different authors classified e-resources depending on the format, function, type of distribution, subject coverage or by content. Some of the classifications systems discussed in the literature were as follows.

A project, funded by the Joint Information Systems Committee (JISC) was undertaken at the University of Wales in the UK, which developed 21 distinct categories of e-resources available within Higher Educational Institutes in the UK. The categories developed were:

" • Online services via vendors hosts/aggregators (e.g. Dialog, DataStar)
• Online database via Web (e.g. Index to Theses)
• Data sets (e.g. Essex Data Archive)
• Text archives (e.g. Oxford Text Archive)
• Gateways (e.g. Resource Discovery Network)
• Open Public Access Catalogue (OPAC) Own institute
• OPACs (from institutions other than own)
• Own HEI websites
• Websites of institutions
• Current awareness services
• Individual article supply and other electronic document delivery services
• Messaging services/e-mail
• Electronic journal collections (Ingenta, JSTOR)
• Single electronic journals (e.g. Nature)
• Individual publisher sites (e.g. Penguin)
• Pre-print collections (e.g. Los Alamos)
• Locally mounted electronic resources such as CD-ROMs
• Search engines (e.g. AltaVista, Google and Yahoo)
• Electronic collection management services (e.g. Blackwells Collection Manager)
• Other web electronic information sources" (Armstrong *et al*, 2001, p.249).

McDowell (2002), identified three "functional categories" of e-resources. These however do not describe the electronic information resources themselves but their nature and use in relation to teaching and learning. These three types included:

"Electronic academic library"

This category included electronic information resources such as e-journals, bibliographic databases, e-books and online theses, based on a concept that using these resources were an equivalent to using the university library. Students traditionally expect to use a library as means of accessing books, journals, bibliographic tools etc.

"Bringing the world into the classroom"

The second functional category includes online access to government and legislative documents, legal documents, historical documents, newspapers, radio and TV materials and official statistics.

"Unregulated electronic information world"

This category relates to the mass of unregulated electronic information resources, especially the many thousand of web sites containing a huge variety of information from diverse sources. These sources were seen as different from traditional library type materials and electronic forms of the conventional primary resources used in libraries.

Apart from the above two categorizations (Armstrong *et al*, 2001; McDowell, 2002) Armstrong and Lonsdale (2007) in the E-Resource Management Handbook 2007, published by the United Kingdom Serials Group (UKSG), categorized e-resources depending on the format. This classification was able to give a better description on e-resources available in libraries and information centers and included:

1. Databases

Databases frequently carry bibliographic records, abstracts, the full text of articles, or factual information (e.g. chemical materials, data sheets or statistics), or data related to a specific subject of field. They are often linked so that a bibliographic reference found in one database may take the user directly to the full text in another (e.g. CrossRef or ArticleLinker) and normally have a web interface.

2. E-Journals

E-Journals are either the electronic replication of a print journal or electronic-only journal. E-journals tend to follow the structure of print journals and their web site is usually fronted by some general information about the title, and an index to volumes and issues. The issues tend to lead to a normally free abstract before a charge is made to access the full-text, which is often given as a PDF (Portable Document Format) document. E-Journals can be distinguished from full-text databases as they contain only articles from journals. Many publishers now have considerable collections of e-journals, while at the same time aggregators offer collections of titles from a range of publishers through a single subscription to some or all of the aggregation.

3. Open access e-resources

This is free access to e-journals and archives of scholarly work which can freely be accessed through the internet. Development of common search standards is fundamental to effective discovery and access of open access e-resources. The Open Archives Initiative facilitates document archives, and preprint and post-print servers connected with a common and easy-to-use interface, and related services such as distributed retrieval options.

4. E-Theses

The huge body of academic research produced within universities has remained largely invisible. There was a concerted move towards facilitating online provision of theses. To facilitate this internationally, a significant number of universities have made their dissertations and theses available in digital form and have developed a range of open-source software packages.

5. E-Books

Publishing of electronic scholarly monographs and textbooks was considered as a major development during the past decade (Armstrong & Lonsdale, 2007). Within academic monograph publishing, there has been a move from university presses to commercial academic and educational publishers. This was complemented by the existence of a substantial body of free e-books made available through text archives such as Gutenberg, the Oxford Text Archive, and the Virginia Text Archive.

6. Geospatial e-resources

Geospatial resources cover a variety of disciplines and are predominantly web-based. The range extends from maps, sometimes backed by a gazetteer service to textual resources including place names and postcodes. A major initiative has been the e-MapScholar project which is a formulation of teaching and learning materials to support geospatial data use within further and higher education.

6. Multimedia and moving image e-resources

Moving pictures and sound is the most established and dynamic e-formats within the e-resource industry. The growing use of images within education and research is reflected in a great number of institutional collections.

7. Emerging types of e-resources

Emerging e-resource types offer innovative approaches for information handling, and they have considerable potential for libraries. Blogs are one such resource which can be used as online diaries. The most obvious potential for blogs in the library is a useful way of providing information to users or staff. RSS, which stands for 'Really Simple Syndication' feeds can be a boon to librarians faced with a need to manage too much information in too little time. Wikis are editable web sites and a useful tool for facilitating online education, or for the creation and delivery of user-generated documentation.

All these products have created a significant change in the nature of information available to users. As described by Kebede (2002), new opportunities have been opened by developments in IT, enabling new ways of information provision, products and services. With the development of these new features, libraries have found their traditional process in need of an overhaul from organization structure, selection, acquisitions, bibliographic control, processing, and preservation to user services. This transformation leads the concept of libraries as active systems rather than passive storage places and advocated the management of electronic materials (Martin, 1998).

2.2.2 Management of E-Resources in Libraries

The library plays a leading role in e-resource management.

> "The availability of this range of resources is only one consideration for librarians, the problems of locating and acquiring appropriate products, as well as the many issues surrounding the management of a collection of e-resources cannot be ignored" (Armstrong & Lonsdale, 2007, p.9).

Turner (2007), described the management of e-resources in libraries as a cycle and named it the e-resources life cycle (Figure. 2.2.2). Basic e-resources management processes include acquiring and renewing of e-resources, giving access to users and support and evaluation of e-resource usage.

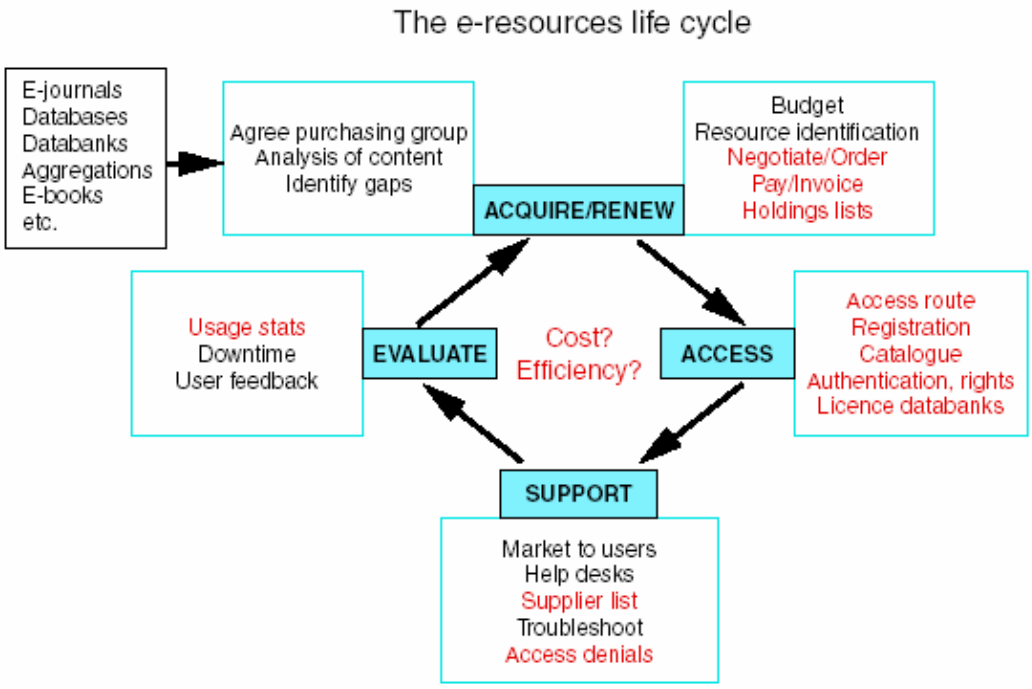
2.2.2.1 Acquiring and Renewing

According to Damayanthi (2006), academic libraries have been wrestling with the thorny issues of managing the acquisition of electronic resources. Martin (1998), described several important issues in which Librarians need to be fully aware of electronic acquisition. These issues included publishers' terms and conditions, archival rights, pricing and mode of access. E-Resources are frequently very costly and librarians have to handle the issues emerging in electronic resource management with shrinking budgets. According to Jayasuriya (2008), Librarians are faced with the difficulties of selecting the most appropriate resources to be acquired for the library with the limited allocation. Therefore, libraries should investigate user needs before acquiring or renewing an e-resource.

2.2.2.2 Access

Access, is a major issue when dealing with e-resources. Once a library has acquired an e-resource, the librarians want to ensure that it is well used. According to Jayasuriya (2008), "Acquisition of resources is not enough, but the university must make sure that access is provided to students" (p. 91). As stated by Moyo (2002) once Web resources have been selected for inclusion in any library collection, and an organization scheme has been developed, the next issue is how to present them in a way, which permits the user to navigate them easily and find the information they need. The library needs to make certain that users can access e-resources easily from an A-Z list or from the OPAC or if relevant, from a meta search tool or via a link server.

Figure 2.2.2 The E-Resource Life Cycle



(Source: Turner, 2007, p.30)

Adding e-resources to the library catalogue so that they are accessible via the OPAC seems an appropriate strategy but this, in turn, raises problems such as password management and the blocking of OPAC terminals by users reading full-text articles. Libraries therefore have to solve all the problems in collection development, licensing, cataloguing and other access issues pertaining to electronic resources. Many libraries have developed their web sites as access gateways to e-resources which provide direct links to e-journals, CD-ROM and important web resources, in addition to the OPAC (Jayasuriya, 2008).

E-Resources are not often free. It is generally necessary to pay a subscription fee, or at least agree to license conditions. Access to the e-resource is quite properly restricted to authorised users however, quite often, the need to restrict access puts barriers in the way of genuine users. More emphasis needs to be given to facilitating access for authorized users. Managing access to e-resources involves a number of processes which include,

Authentication - identifying the person requesting the access

Authorisation - determining that person's identity, and often using other sources of information, what privileges the individual has and hence whether access should be denied or granted

Accounting - maintaining logs of events for the purpose of generating management information on resource usage.

Authentication and authorisation can be achieved via username and password, IP address or Athens logging. Nowadays library users are wishing to access e-resources remotely.

> "Especially in the context of consortia and other cooperative agreements, the defining user population for the purpose of licensing electronic information resources is a challenge for the librarian" (Damayanthi, 2006, p.29).

In that sense, using username and password for access management is a better solution.

IP authentication provides a simple way of recognising an authorised user. When the license terms are agreed for a new resource, the organisation generally registers its IP address range. Then any personal computer from that IP address range is deemed to be authorised. This happens seamlessly without the user knowledge or action and is very effective. However, it does generally limit access to users on-site or on-campus. Even for on-site users, access is limited by the number of computers on-site, particularly public access computers. Users who spend large periods of time off-site, arguably all distance learners are likely to experience access difficulties, and as a result it is becoming increasingly clear that IP ranges are not the complete solution.

National Information Systems and Services (NISS) UK initially developed the Athens access management system. Eduserv Athens today is a comprehensive access management system which controls access to over 260 e-resources. With one Athens username issued by the organisation, the user can be authorised for access to all the organisation's Athens resources. These usernames can be used anywhere and at anytime, thus empowering the user, and maximizing the investment in e-resources. What ever the mode of access, it is necessary that the customer can authenticate their users so that only those who genuinely have access rights can gain access.

2.2.2.3 Support

As the focal point of e-resource management, the library should advertise the available e-resources for their patrons and make them aware of how to access those resources. Today, marketing e-resources has become a challenge to libraries and information centers. Helinsky (2007) has identified two types of marketing in relation to e-resources. The first type is internal marketing which is targeted to management, the senior people and the decision-makers at universities. These people are usually very interested in e-resources but they want to access them in a simple way, and to understand them immediately. They also require justification on why the e-resources seem so expensive. The second type is external marketing and is targeted to library users, to whom it is important to expose them to the available e-resources and emphases how easy it is to use these resources.

Although e-resources itself can be used for marketing library services, very few libraries are using desktop software to market e-resources and even fewer are using them on a regular basis. Moreover libraries can combine both electronic forms with manual marketing strategies to reach it's users. The library e-newsletter is a good example for a marketing tool. However, providing necessary training courses for staff and students is a better solution when introducing new resources. It is very important that, these are presented by people with an academic background and good communication skills. According to Renwick (2005) the effectiveness of library's e-resource usage depends on the training programs conducted by the library. The author has also stated that the ability of library staff to keep up to date is necessary and therefore, training for the staff also is crucial as well.

Other than giving publicity and training, the library has to ensure the smooth functioning of e-resource services. If there is a trouble shoot or access denials, the library should solve the problems as soon as possible as users demand a solution within minutes.

2.2.2.4 Evaluation

The success of e-resource management requires monitoring, and evaluation of both use and customer satisfaction. The library can get a better feedback and develop by keeping an eye on the less satisfied customers than those who are satisfied and happy with their services. Thorough monitoring of use might include the gathering of statistics for different categories of user, matching usage against potential usage, questionnaires to evaluate outcomes, the

testing of citing in academic bibliographies, and measuring failed accesses and turn ways. Moreover, usage statistics on electronic information services played a major role in purchasing the new resources (Damayanthi, 2006) and renewing existing e-resources. An e-resource subscription is typically valid for a defined time period. When the period ends, the librarian must either renew the subscription or cancel it. Unlike the decision at the selection phase, this decision is based on the information accumulated in the management system, such as the actual usage of the resource while it was available, the reliability of the interface, and the responsiveness of the provider.

2.2.3 Perceived Benefits of E-Resources

Today's users have their information needs met via a number of products. The range of products may exist in different forms such as paper, microforms, CD-ROM, or online accessible databases. Among them e-resources are now recognized as the most important source of information and they consume ever increasing budgets from library allocations (Damayanthi 2006). It was found that seeking information through the internet was highly significant when compared to other resources (Armstrong *et al*, 2001). The main reason of popularizing e-resources over other formats was the perceived benefits which are to be discussed in the next paragraph.

Most of the authors stated that quickness, speed and ease of use were the most important factors in using e-resources (Pickard, 2005; Armstrong *et al* 2001; Moyo, 2002). According to Armstrong *et al* (2001), "saving time is a priority for many users" (p.258) in searching for information. Access to e-resources has reduced the time spent searching for information (Renwick, 2005). It is also easier to gain information from electronic information resources than other library materials such as textbooks (Pickard, 2005) because users do not need to wait in lines or walk around with heavy books.

Remote access is another benefit of e-resources.

> "Users need not come physically to the library to use print formats but can stay at home or the office and access online library resources and services via network or authentication methods at any time" (Renwick, 2005, p.21).

According to Dadzie (2005), e-resources are convenient to use since users are able to access information from the library, internet cafe, offices or at times from the comfort of their own

homes at any time of the day. As Banwell *et al* (2004) stated, the main benefit of e-resources to users was perceived as accessibility and timeliness.

E-Resources provide access to current information as these are often updated frequently. Users prefer access to information which is up to the minute, international in scope and not available elsewhere (Renwick, 2005). Current information is very important for researchers of dynamic disciplines such as medicine and computer sciences. In this sense, e-resources is an invaluable research tool for researchers.

The ability to access a vast amount of information is another benefit of e-resources. As Pickard (2005) noted, e-resources has increased the amount of information available. It provides cross-references and the flexibility of having various ways to get at the same topic. "Through their various search techniques, e-resources provide extensive links to explore additional resources or related content" (Dadzie 2005, p.290)

E-Resources also provide interaction facilities such as e-mailing, online help, librarian assistance or blogs. Science students in particular appreciate interactive sites which provide solutions and answers (Urquhart *et al,* 2003). Value added features of e-resources which include, multimedia hot links, customized personal information filters, e-mail alerts, copyright protection, electronic payments, access to archives and RSS (Really Simple Syndication) feeds also provide vast amounts of benefits to the users and make information access easier.

2.3 The Internet

According to the Online Dictionary of Library and Information Science, e-resources are materials which can be accessed via peripherals attached to a computer such as a CD-ROM drive, or remotely via a network, such as the Internet. Today the Internet is the main method of accessing the e-resources.

The Internet is a network of information networks and in broad sense it is a group of interconnected, but logically independent networks (Senevirathne, 2003). The Internet was defined in a descriptive way as the high-speed fiber-optic network that uses TCP/IP protocols

to interconnect computer networks around the world, enabling users to communicate via e-mail, transfer data and program files via FTP, find information on the World Wide Web, access remote computer systems such as online catalogues and electronic databases easily and effortlessly, using an innovative technique called packet switching (Reitz, 2004).

The Internet is one of the most significant technological developments of the late 20th century. It was started in the late 1960's under its original name of the ARPANET (Advanced Research Project Agency Network) and at that stage designed to be used by the military only (Hinson & Amidu, 2006). In 1986, the National Science Foundation (NSF) of the United States set up a network named NSFNET. As NSFNET successfully functioned, it replaced the ARPANET and ARPANET was shutdown in 1990. After 1990, the Internet was formed from the network that met a standard set of protocol known as TCP/IP (Transmission Control Protocol/Internet Protocol). Given the exponential growth of the internet, it is estimated that everyone in the world will be connected by the year 2003 (Soong *et al*, 2001).

The Internet is a major technological advancement reshaping not only our society but also education (Volery and Lord, 2000). As described by Seneviratne (2003), the Internet can be med to carry out three different roles in higher education as:

"- An information retrieval tool
- An information resource
- A communication tool" (Seneviratne 2003, p. 6).

The evolution of the Internet was punctuated by the introduction and mass acceptance of internet tools (Ciolek 1999). These internet tools improved the ways of access to vast amounts of information on the networks using different software packages (Seneviratne 2003). Telnet, FTP (File Transfer Protocol), Archie, Gopher Veronica and WWW (World Wide Web) are some of the information retrieval tools used to access information on the networks. Among them WWW or The Web, is an increasingly pervasive addition on top of basic Internet protocols that makes it possible for people world wide to access and publish globally accessible hypermedia documents.

The Internet is also considered as an information resource as it provides access to unlimited sources of information. The volume of information on the internet is consequently increasing.

According to Hinson and Amidu (2006), the most difficult task for internet users is navigation, that is, finding out the existence of relevant files or databases. Several internet services have been designed to improve file location and transfer. These services include directories, search engines, meta search engines and information gateways. Furthermore, all the electronic information resources including e-books, e-journals, databases, e-theses, open access resources and geospatial resources are accessible through the internet on a free basis or depending on the conditions of subscription.

The Internet provides a medium of communication through various virtual communication tools including e-mail, newsgroups, web forms, chat or conferencing, instant messaging and internet telephony. These communication tools provide a timely and effective means of discussing current issues, exchanging new innovations and research ideas.

Apart from the use of this information and communication medium, today the internet is med as a delivery method of education. The situation is described as,

> "the rapid expansion of the Internet as potential course delivery platform, combined with the increasing interest in lifelong learning and budget restrictions, has created a significant incentive for universities to develop online programs" (Volery & Lord, 2000, p.216).

2.4 E-Resource Based Learning

Changes in the global economy and advancement in ICT have made a big impact on society including education and have affected the form and structure of teaching and learning. According to Soong *et al* (2001), tertiary education should take necessarily transform in order to keep abreast of changes. Le Grew (1995) (cited in Soong *et al*, 2001) noted that many institutions were in the process of transformation to gain an advantage in the information age. He identified a number of trends which contributed to the transformation and named it as a 'paradigm shift' in tertiary education (Table 2.4).

Table 2.4. The Trends Causing a Paradigm Shift in the Tertiary Education

From		To
Industrial society	→	Information society
Technology peripheral	→	Multimedia central
Once-only education	→	Lifelong learning
Fixed curriculum	→	Flexible, open curriculum
Institutional focus	→	Learner focus
Self-contained	→	Organization Partnerships
Local focus	→	Global networking

(Source: Le Graw ,1995 cited in Soong *et al*, 2001)

The impetus to use computers in education followed immediately after their development in the mid 20th century. As in all other fields it makes studies easier with speedier processing, high memory capacity and the ability to handle a large amount of data. As stated by Volery and Lord (2000),

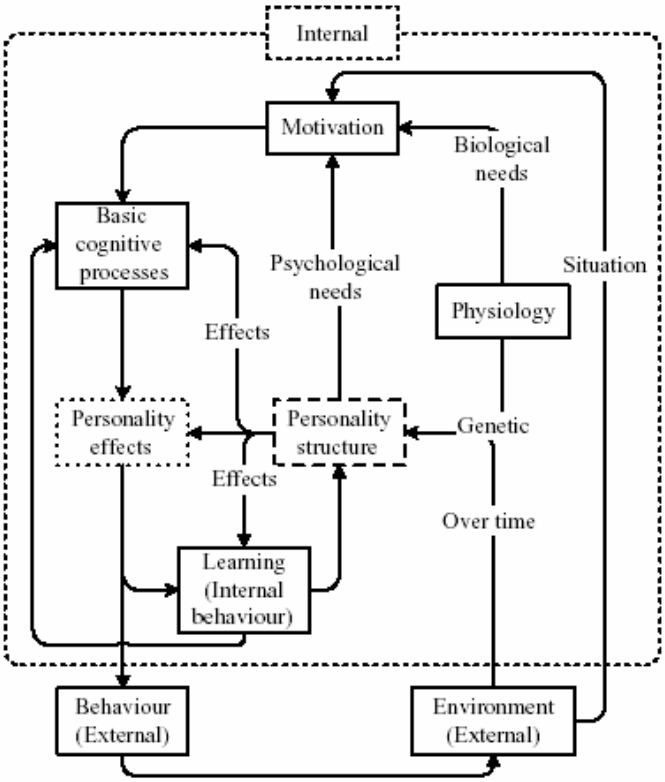
> "with the introduction of networks, computers able to provide an unparalleled capacity to manage and access large amount of information, and present it in a novel and interesting way" (p.217).

Learning is an active, constructive (Kozma, 1991) cumulative and goal oriented process (Shull, 1990). The learner strategically manages the available cognitive resources to create new knowledge by extracting information from the environment and integrating it with information already stored in memory (Kozma, 1991). All individuals have their own unique framework upon which all future learning builds and it is at the level of information input that the external environment can begin to impact, positively or negatively, upon that framework (Bedford, 1993, cited in Pickard, 2005).

According to Huang, *et al.* (2006), the learner behavioral process plays an important role in the learning process. He described the generic human behavioral process in the learning frame work in a schematic diagram (Figure 2.4). As he stated, behavior is generally initiated by a motivation which is stimulated from three sources: environmental, physiological and psychological. In the electronic learning context, the environment becomes the most influential aspect of these three sources. External environmental aspects, such as social,

economic and political influences, motivate the learner to learn, and these aspects work together with the internal physiology and psychological aspects of the learner throughout the learning process (Huang, *et al*, 2006). As stated by Pickard (2005), information is also one of the external factors. Past research also indicates that learning and cognitive development are intricately linked to opportunities to process and interact with relevant information and the medium used to deliver this information may well have an impact on these opportunities (Kozma, 1991).

Figure 2.4. Human Learning Behavioral Process



(Source: Huang *et al*, 2006, p.368)

Since learning is an active, constructive and cumulative process and information can impact on learning, the learner must be provided with high quality, accessible and relevant information (Pickard, 2005). Libraries as information providers, offer a variety of information products and services. The arrival and proliferation of e-resources have influenced and changed the nature of information available to users. In that sense, e-resources, such as online databases, e-books, e-journals and websites provide current,

relevant and accurate information for users in their learning process. As stated by Mc Dowell (2002) e-books, e-journals and online theses provide primary information for learning and research and it is equivalent of using print formats of books, journals and theses. In contrast, search engines and websites provide a variety of information from diverse sources to fill the gap in primary information in the learning process. On the other hand, as learning is an active process, e-resources provide the necessary interactive environment to the users through different communication tools. As stated by Candy *et al* (1994), computer based learning allows students to become active learners rather than mere passive recipients of teaching.

It is important to note that information skills and knowledge to interact with e-resources help to obtain maximum benefits from e-resources. According to Kebede (2002), e-resources have unique requirements that users should have access to own.

> "These are basically comprised of availability and accessibility of appropriate computer hardware, software and other related equipments, which include quality and ease of use of interface and retrieval or search engines" (Kebede 2002, p.16).

He also stressed that adequate user knowledge and skills to interact with and manipulate the hardware, software and the different e-resources as well as to identify and define their needs are important in the electronic environment. Further, by finding information using e-resources, information skills such as the ability to use search strategies and identify reliable sources became important.

2.5 E-Learning

E-Learning has become the most significant recent development in the field of education. It can be considered as the highest achievement of using ICT in education. E-Learning is viewed as the delivery of course content via electronic media or in broader sense, it provides instructions from a single host site to multiple distance sites by taking advantage of synchronous/ asynchronous computer-based interaction, local area networks, wide area networks and the internet (Choi *et al*, 2007). It includes the provision of student access to learning resources, the facilitation of communication and collaborative work among and between students and academic staff via network communication technologies such as chat

forums, instant messaging and video conferencing, the assessment of individual students or group of students and the provision of administrative and student support.

According to Volery and Lord (2000), the literature on online delivery in the field of education has emerged since the early 1990s with the advent of the internet. There has been a concomitant interest in a variety of issues which have emerged that are linked to online delivery and numerous terms such as distributed learning, computer-based learning, online learning and web or internet based learning. The concept of e-learning was formally introduced at the 'Internet-based training' workshop at the American Society for Training and Development in1996 (Huang *et al*, 2006). The term e-learning flourished in 2000 and as Henry (2001, p. 249), stated "yet a short time later there are literally thousands of companies in the e-learning business". Universities and higher educational institutes have started to recognize e-learning as having the power to really transform the landscape of people, performance, knowledge and skills.

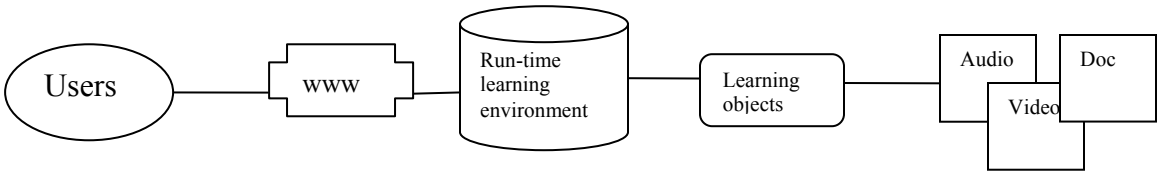
Some authors viewed e-learning as a recent evolution of distance education, which according to Choi *et al* (2007), ranges from passive and asynchronous distance learning using written or printed materials, audio, videotapes, telephone and computer-assisted instruction, computer-based training with stand-alone computers to active and synchronous distance learning by using two way interactive technology with the use of the internet and the world wide web.

The concept of e-learning was defined by different authors. Very briefly, it can be viewed as the delivery of course content via electronic media, such as the internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV and CD-ROM (Selim 2007). E-learning is defined by E-learning advisory group as,

> "e-learning is learning that takes place in the context of using the internet and associated web-based applications as the delivery medium for the learning experience" (E-Learning Advisory Group 2002, p.11).

Huang *et al*. (2006), proposed a framework for a web-based e-learning system (Figure 2.5), which uses a web browser as the interface. Through run-time learning environments, user could access the learning objects, which are directly linked to multimedia learning resources such as lecture video/ audio, presentation slides and reference documents.

Figure 2.5. Architecture of the E-Learning Framework



(Source: Huang *et al*, 2006, p.356)

The e-learning solution as described by Henry (2001) comprises of three key elements, which includes content, technology and services. The author elaborated on content as the classroom content and published content. The former of which has basic course materials and the latter, additional materials which could be used as supplementary materials for basic course content. He explained technology as the infrastructure such as internet, intranet and other delivery platforms and learning management systems. There services include consulting and support to assist users in technical, implementation and other difficulties.

As e-learning has attracted considerable research and development funding and commercial interest, several authors suggest key components that influence the quality of the e-learning experience. The efficient and effective use of IT in delivering e-learning based components of is of critical importance to the success and student acceptance of e-learning. Selim (2007) has expressed his idea as,

> "...ensuring that the university IT infrastructure is rich, reliable and capable of providing the courses with necessary tools to make the delivery process as smooth as possible is critical to the success of e-learning" (p.399).

E-learning projects that were not successful in achieving their goals did not have access to technical advice and support (Soong *et al* ,2001).

Piccoli *et al* (2001) presented some factors potentially affecting e-learning systems which include human factors (students and instructors), technology, learner control, course content and interaction. On the other hand, Alexander (2001) introduced a framework for developing

a successful e-learning system and it included basic concepts such as university context, teacher thinking, teacher planning and teacher strategies.

E-Learning was viewed as having the potential to improve the quality of learning: access to education and training, the cost-effectiveness of education and reduce the cost of education (Alexander, 2001). Volery and Lord (2000) described reasons of introducing e-learning in universities,

> "the rapid expansion of the internet as a potential course delivery platform, combined with the increasing interest in lifelong learning and budget restrictions, has created a significant incentive for universities to develop online programs" (p. 216).

The authors identified four reasons of popularizing e-learning as a mean of

> "-expanding access,
> - alleviating capacity constraints,
> - capitalizing on emerging market opportunities, and
> - serving as a catalyst for institutional transformation" (p. 216).

2.6 Critical Success Factors (CSF)

The term Critical Success Factor (CSF) first appeared in literature in the 1980s (Selim, 2007). The concept originated in the field of management and was developed by D. Ronald Daniel of McKinsey and Company in 1961. The process was refined by Jack F. Rockart in 1979 (Bullen & Rockart, 1981).

Critical Success Factors refer to the personal and individual factors that are essential if an organization is to be successful in achieving its goals. Critical Success Factors were defined as a limited number of areas in which results, if they were satisfactory, will ensure successful competitive performance for the organization (Rockart, 1979, cited in Shah & Siddiqui, 2006). According to Selim (2007), CSFs should be few in number, measurable and controllable. They represent the few factors which are critical to the success of the organization. CSFs are of sufficient importance that these key areas of activities should receive constant and careful attention. They are not a standard set of measures, which can be applied to all types of organizations. They are very specific to a particular division of a particular organization (Bullen & Rockart, 1981). They introduced five prime sources of Critical Success Factors;

"- the industry or the field
- competitive strategy and industry position
- environmental factors
- temporal factors
- managerial position" (p. 14)

Though the concept was developed with the managerial sector, it is being used in several other fields such as health and information technology. Bullen and Rockart (1981) developed a methodology involving three stages to define elements required for the successful performance of an organization. These three stages were;

Stage 1. Identification of goals and objectives of the organization/ department/unit.

Stage 2. Identification of the Critical Success Factors required to achieve the goals and objectives

Stage 3. Determination of how achievement would be measured.

In the NZCER report (2004), this three-stage process was adopted for the educational setting and is described in Table 2.6. In stage 2 (iii) is the point at which the critical success factors need to be identified and built into the teaching and learning environment.

Table 2.6. Stages of Defining Elements Required for the Successful Performance of an Organization.

Level	**An organization**	**Educational setting**
Stage 1	Identification of goals and objectives of the organization/ department/unit.	Identify the learners' goals through a process of needs analysis.
Stage 2	Identification of the Critical Success Factors required to achieve the goals and objectives	i. Assess what the learners are currently able to do; ii. Analyse what has to be achieved to move them from their current position to their identified goals; and iii. Specify what is necessary to make this happen.
Stage 3	Determination of how achievement would be measured.	Decide how to identify and measure whether or not learners' goals are achieved

(Source: NZCER report 2004, p.16.)

Although CSF techniques were originally developed for managerial roles, they can be adapted to determine the individual priorities and the areas where information would contribute to the individual's goals (Urquhart *et al,* 2003).

As Shah and Siddiqui (2006) stated this technique though quite old is still being widely applied to evaluate new technologies such as Information Technology (Ikart, 2005; Urquhart *et al*, 2003) e-learning (Volary & Loard, 2000; Selim, 2005; Soong *et al,* 2001) and e-banking (Shah & Siddiqui, 2006). Use of CSF techniques in the Information Systems (IS) field is very common (Shah & Siddiqui, 2006) and the authors concluded that although diverse methods have been employed by researchers to operationalise the concept, it has been utilized successfully in many areas within the IS discipline.

It is important to note that most of the studies are used to extract Critical Success Factors from theories in the relevant fields. Kamal (2006), used several Information Technology adoption theories to identify Critical Success Factors in IT innovation adoption in the government sector. In another study, Ikart (2005), investigated critical success factors for Executive Information System usage in organizations based on three important theories in predicting human behavior. Critical Success Factors for adaptation of new technologies such as e-learning, computer based learning, e-banking and Executive Information Systems were based on technology acceptance theories.

2.7. Theories on Technology Acceptance

The issue of learner satisfaction and acceptance in the digital environment is very important. A high level of learner satisfaction and acceptance reflects that the users are willing to continue to use the technology (Lau & Woods 2007). Several intention-based theories and models have been proposed and empirically tested over the last decade in understanding user adoption and usage of information technology innovations. For example, Fishbein and Ajzen, in1975 proposed the theory of Reasoned Action (TRA), Davis and his colleagues, in1989 introduced a Technology Acceptance Model (TAM), Ajzen, in1991 proposed the Theory of Planned Behavior and Roger, in1995 tested the Innovation Diffusion Theory (Lau & Woods 2007). These frameworks have been applied to a variety of information technologies in different contexts and populations. Among them, the Technology Acceptance Model and Theory of Reasoned Action were the most influential and frequently tested models, and was

widely applied to explain general IT adoption in IS literature (Adams *et al*, 1992; Teo,2001; Ikart, 2005; Choi *et al*. 2007; Lau & Woods ,2007) .

2.7.1 The Theory of Reasoned Action (TRA)

The Theory of Reasoned Action was perhaps one of the most influential efforts to generate and test a general theory of attitude- behavior links (Choi *et al*, 2007). The theory begins with the assumption that an individual behaves in accordance with his or her conscious intention which is based in turn on rational calculations about the potential effects of behavior. In other words, belief of an individual helped to influence the attitudes, which in turn shaped behavioral intention (Ajzen & Fishbein 1980, cited in Ikart, 2005).

Attitude is a person's consistently favorable or unfavorable evaluation, feeling and tendency towards an object, behavior or idea. In TRA, only the evaluating component of attitude is considered. (Choi *et al,* 2007). A person will thus have a more positive attitude towards performing an action if he or she believes it will have major beneficial consequences. External stimuli are believed to influence attitude only through a change in the person's belief structure.

2.7.2 The Technology Acceptance Model (TAM)

The TAM is a specific model developed to explain and predict how users come to accept and use a technology in a particular computer based situation (Lau & woods, 2007). TAM was originally conceived by Davis in 1986 (Davis 1989). Davis developed TAM while under contract to IBM Canada Limited to evaluate the market potential for a variety of emerging PC-based applications in the area of multimedia, image processing and pen-based computing in order to guide investments in new product development (Davis 1989). TAM is an adaptation of the Theory of Reasoned Action (TRA) from social psychology (Ikart, 2005). The objective of TAM is

> "to provide an explanation of the determinants of computer acceptance that is capable of explaining the behavior of users across a broad range of end-user computing and user populations while concurrently being parsimonious and theoretically justified" (Davis, 1989, p.985).

It predicts user acceptance based on the influence of two user beliefs; Perceived Usefulness (PU) and Perceived ease of use (PEU). Both PU and PEU have a significant impact on a user's attitude towards using the system.

2.7.3 Definitions of key constructs in TAM and TRA

Perceived Usefulness : Davis (1989, p. 320) defined PU as the user's "subjective probability that using a specific application system will increase his/her job performance within an organizational context".

Perceived Ease of Use : Davis (1989, p.320) defined PEOU as "the degree to which an individual believes, that using a particular system world be free of physical and mental effort".

Attitude Towards Using: TAM is based on TRA attitude paradigm which specifies how behavior relevant components of attitudes can be measured. It distinguishes between belief and attitudes and specifies how external stimuli such as objective features of attitude object, are causally linked to beliefs, attitudes and behavior (Davis, 1989).

2.8 Summary

E–Resources are important information sources as they provide current information overcoming the barriers of pace, time and location. There were different formats of e-resources evolutionarily developed through the past two decades. E-Resources have been categorized depending on the format, function type of distribution, subject coverage or by content. Whatever the categorization, some resources fall into more than one category and with the invention of new e-resource products the boundaries of these categorizes have become obscure.

Libraries play a remarkable role in e-resource management which includes acquiring and renewing, giving access, supporting and evaluating e-resource usage. Literature concluded that the effectiveness of e-resources usage depended on support provided by the library. E-Resources are popular among students because of the benefits they gain and summarized as quickness, ease of use, remote access and availability of vast amount of information.

The Internet was discussed as the main gateway to the e-resources. According to literature the Internet played three different roles as an information retrieval tool, an information resource and a communication tool in higher education. E-Resource based learning is the basic concept in the present study. There was no established definition for e-resource based learning in the past literature. The present study uses the concept of e-resource based learning which means using e-resource for academic and research purposes. In contrast to e-resources based learning, e-learning was a well developed concept and was defined in most of the literature. Today e-learning is using to deliver all sorts of undergraduate, postgraduate and training programs.

The objective of the current study is to investigate the Critical Success Factors on e-resource based learning. The Critical Success Factors technique was originally developed in the field of management but it is heavily used in information system literature. Critical Success Factors can be derived from the organization, the environment and from the individuals. It is important to note that some authors derived Critical Success Factors from theories which describe human psychology and behavior. The Technology Acceptance Model derived from the Theory of Reasoned Action was the most common theory used in related literature.

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Chapter 3

Contextual review

3.1 Introduction

The availability of a vast array of e- resources accessed from the Internet, the Web or other forms of electronic storage is widely viewed as a significant feature of contemporary education. New learning environments such as e-learning provides a delivery platform for university courses, thereby, causing a considerable interest in investigating the usage, user behavior, user acceptance and other factors that affect the successful use of new technology in university education. The contextual review aims to discuss the previous research affecting e-resource usage and e-learning. This chapter presents related research under two subtopics factors affecting e-learning and those affecting acceptance and usage of Information Technology. All the related research used to identify factors for the present study are summarized in Table 3.3. The identified Critical Success Factor categories are discussed at the end of this chapter. Finally, the chapter concludes by reviewing important facts and literature gaps drawn from the review.

3.2 Factors Affecting E-learning

"Critical Success Factors in online education" was studied by Volery and Lord (2000) based on an online business management course at the Curtin University in Australia. The course was delivered using WebCT: a web publishing software to develop online courses. Three basic variables that have an affect on the effectiveness of online delivery were identified by intensive literature survey which included technology, instructor characteristics and student characteristics. A set of eleven factors were developed using a five-point Likert scale to capture the reliability, quality and medium richness of the technology. A set of twelve factors were developed to capture the instructor characteristics. Student characteristics were identified by using six items of demographic variables and previous computer experience. According to the findings, there is a significant relationship between teaching effectiveness and technology. A factor analysis was conducted to identify the underlying factors in technology and instructor characteristics using the Varimax method. The study identified three critical success factors in online education: technology (ease of access and navigation, interface design and level of interaction), the instructor (attitudes towards students, instructor

technical competence and classroom interaction) and the previous use of technology from a student's perspective.

"Critical Success Factors for on-line course resources" was a multiple case study used to evaluate the critical success factors for on-line course resources in a tertiary setting in Singapore by Soong *et al* (2001). The study was conducted using three subject modules and took lecturers and students as two units. Constructs were developed to measure perceived IT infrastructure, technical support and mindset (about learning) of lecturers and students. Data was gathered using interviews and questionnaires. The findings showed that in order for on-line course resources to be used successfully, the critical factors that need to be considered are: human factors pertaining to the instructors; the instructors' and students' technical competency; the instructors' and students' mindset (about learning); the level of collaboration intrinsic in the course; and the level of perceived IT infrastructure and technical support.

Choi, *et al* (2006) conducted a study on Enterprise Resource Planning (ERP) training with a web-based electronic learning system based on the flow theory. Authors used Flow theory and Theory of Reasoned Action (TRA) as the theoretical background. It used data from e-learners who participated in a program on ERP training with a web-based e-learning system supported by the Korean Ministry of Information and Communication. This study presented an e-learning success model containing a flow construct and attitude as its central features. The model was empirically explored for how the two key mediation variables of flow experience and attitude, as influenced by their antecedents, affect learning outcomes in the context of ERP training with the web based e-learning system. Data was gathered by a mail survey. The reliability of measurement items was assessed by the internal consistency method. The results confirmed that the two mediating variables (i.e., flow experience and attitude towards e-learning) have a significant impact on learning outcomes in e-learning, and that the antecedent factors related to flow experience could be different from those related to attitude. These antecedent factors included learner interface, interaction, instructor attitude towards students, instructor technical competence, and content. In this study, the learner interface of an e-learning system and content are revealed as important predictors of both flow experience and attitude towards e-learning. Especially, content appears to be the strongest predictor, whilst the factors regarding instructor characteristics (i.e., instructor

attitude towards students, instructor technical competence) have a relatively weak influence on flow experience and attitude towards e-learning.

Eom *et al,* (2006) carried out a research to investigate the determinants of students' perceived learning outcomes and satisfaction in university online education at Midwestern University in the United States. Structural Equation Modeling was applied to examine the determinants of students' satisfaction and their perceived learning outcomes. Six variables tested in the study as potential determinants of online learning are course structure, instructor feedback, self-motivation, learning style, interaction, and instructor facilitation. According to the findings and conclusions, all six factors significantly influenced student's satisfaction. Out of six factors, only two (learning styles and instructor feedback) supported the perceived learning outcomes. The study also concluded that a well-designed online course delivery system is likely to reduce the need of interactions between instructors and students.

A study on "Critical Success Factors for e-learning acceptance" was carried by Selim (2007) using five colleges of Business and Economics in the United Arab Emirates University (UAEU). This study specified e-learning Critical Success Factors (CSFs) as perceived by university students. Depending on previous literature, critical factors for e-learning was grouped into four categories: (1)instructor; (2) student; (3) information technology; and (4) university support. Each CSF category was observed via a group of indicators. The study used Structural Equation Modeling (SEM) technique to specify and validate the underlying critical indicators in each of the e-learning CSF categories. According to the results obtained, eight critical indicators in each of the e-learning CSF categories were identified. Those are instructor characteristics (attitude towards and control of the technology, and teaching style), student characteristics (computer competency, interactive collaboration, and e-learning course content and design), technology (ease of access and infrastructure), and support. All indicators of the instructor's attitude towards and control of technology indicated high levels of criticality to measure the posited category. The most critical indicators were instructor's attitude towards interactive learning and teaching via e-learning technologies. The survey also concluded that previous student experience with personal computers came as the most critical factor within the student characters. In the technological dimension, the ease of use of the course web was the most critical factor followed, by browser efficiency and screen design. Author assumed that these eight e-learning critical success factor (CSF) categories

can assist universities and instructors to efficiently and effectively adopt e-learning technologies.

"E-Learning: The student experience" was a qualitative study done by Gilbert *et al*. (2007). The study drew comments from students to evaluate an e-learning module on a MSc in Information Technologies and Management, to develop a picture of their perspective on the experience. A questionnaire was used to gather data on module content, module learning objects, core document, discussion forums and threads, tutor performance and module activities. Findings that revealed users satisfaction on e-learning module are:

1. success in promoting synergy between theory and practice
2. specific themes in the module that widen their horizons and experience
3. discussion forums and interaction with other students and
4. other learning support with a focus on access to documents and other resources.

When expressing dissatisfaction, students discussed

1. robustness and usability of the delivery platform
2. access to resources, such as articles and books
3. currency and implicitly relevance of study materials and
4. student work scheduling.

An investigation on user perceptions and attitudes towards learning objects was carried out by Lau and Woods (2007). This study empirically evaluates the technology acceptance model drawn from literature on Information Systems (IS) to investigate how user beliefs and attitudes influence learning-object use among higher education learners. The authors developed a research model to illustrate that actual use and behavioral intention is determined by both attitude and perceived usefulness. Perceived Usefulness and Perceived Ease Of Use both have a direct relationship with attitude. Perceived Ease of Use also influences Perceived Usefulness. This study utilised a web-based survey to collect data. The target population for the study consisted of undergraduate IT students enrolled at the Faculty of Information Science and Technology (FIST), Multimedia University in Singapore. Scale reliability and validity were assessed via confirmatory factor analysis (CFA).

The findings clearly showed that an individual's attitude towards the use of the learning object is significantly influenced by the individual's perception about ease of use and usefulness. User perceptions of usefulness had an even stronger influence on attitudes than user perceptions of the learning objects' ease of use. Judged by its direct relationship to attitude and behavioral intention to use, Perceived Usefulness was found to be the most significant factor influencing the users' acceptance of learning objects. At the same time, behavioral intention to use the learning objects was highly related to the attitude and perceived usefulness.

3.3 Factors Affecting Acceptance and Usage of Information Technology

Adams, *et al* (1992) carried out a research on "Perceived Usefulness, Ease of Use and Usage of Information Technology". This was a replication of a previous work by Fred Davis in 1989. Both these studies focused on evaluating the psychometric properties of the Ease of Use and Usefulness scales, while examining the relationship between Ease of Use, Usefulness and system usage. The study was carried out in two parts; as study one and two. Study one used electronic mail and voice mail as the two Information Technology Systems. A total of 118 respondents from ten organizations including high schools, technical colleges, community colleges, universities and postgraduate institutions were surveyed for their attitudes towards two messaging systems.

The second study used three popular software applications (WordPerfect, Lotus 123 and Harved Graphics) and examined the expectations that they would all be rated highly on both scales. The usefulness and ease of use scales showed a high level of reliability and validity. In addition the research tested the relationship between Ease of Use, Usefulness and Usage using a structural equation method. The results of the study one revealed that Usefulness was the important determinant of system usage. Results in study 2, though varied, indicated the importance of both Ease of Use and Usefulness.

A study on the "Critical Success Factors for Executive Information System (EIS) usage in organizations" was conducted by Ikart (2005) using 255 organizations in Australia. The study investigated and examined the cultural, social, individual and organizational Critical Success Factors that explain executives' behavior to adopt and use EIS. Further, the study established the relative importance of these variables. The Technology Acceptance Model

(TAM), Theory of Reasoned Action (TRA) and Trandis Framework (1979) were used in predicting human behavior. The study extended TAM factors, perceived usefulness, perceived ease of use, attitudes towards using and behavioral intention with such variables as habits, social factors and facilitating conditions from Trandis framework to derive the research model suitable for the adoption and usage of EIS in organizations. Data was collected using questionnaires from executives from selected organizations. The results of this study emphasized the importance of social, cultural, individual and organizational variables in explaining executives' behavior towards adoption and use of EIS by means of perceived usefulness, perceived ease of use and attitudes towards using. The author ranked these variables from most influential to least influential as social, cultural and organizational.

Research which relates to factor identification is summarized in Table 3.3. The table presents the information in the field of application, methods used, data analyzing methods and factors.

Table: 3.3 Research Summary

Author (Year)	Field	Theories	Respondents/ Test audience	Data Collection Methods	Scale used	Method of analysis	Factors
Adams *et al*. (1992)	IT usage	TAM	118, 73 students	Survey questionnaire	Five-point Likert	Structural Equation Method with LISREL	Three factors: perceived usefulness, perceived ease of use, usage.
Volery & Lord (2000)	E-learning		47 University students	Survey questionnaire	Five-point Likert	Pearson Correlation/ Factor rotation by Verimax method	Three factors: technology (ease of access and navigation, interface design and level of interaction); instructor (attitudes towards students, technical competency, classroom interaction) and student characteristics
Soong *et al*. (2001)	E-learning		50, 20, 16, Postgraduate students	Interviews/ Questionnaire/ Archival records	Five-point Likert	Averages	Five factors: Human factors, technical competency, mind-set, collaboration and perceived IT infrastructure.
Teo (2001)	Internet usage	TAM	16 University students	Interview/ Survey questionnaire	Five-point Likert	Factor Analysis by Verimax/ Hierachical Regression Analysis	Three factors: perceived usefulness, perceived ease of use, perceived enjoyment.
							Cont.

Author (Year)	Field	Theories	Respondents/ Rest audience	Data collection methods	Scale used	Method of analysis	Factors
Ikart (2005)	EIS usage	TAM, TRA, Trandis Framework	201 Executives	Survey questionnaire	Five-point Likert	Factor Analysis Multiple Regression/ ANOVA/ MANOVA	Six factors: habits, facilitating conditions, social factors, perceived usefulness, perceived ease of use, attitudes.
Choi *et al*. (2006)	e-learning	Flow theory TRA	236 High school students	Survey questionnaire	Five-point Likert	Confirmatory factor analysis LISREL 8.54	Eight factors: Learner interface, interaction, instructor attitudes, instructor technical competence, content, attitudes towards e-learning, flow experience, learning outcomes.
Eom *et al.* (2006)	e-learning		397 Uni. students	Survey questionnaire		Structural Equation Model –based PLS	Eight factors: Course structure, instructor feed back, self motivation, learning style, interaction, instructor knowledge and facilitation, user satisfaction and learning outcomes.
Selim (2007)	e-learning		538 University students	Survey questionnaire	Five-point Likert	Confirmatory Factor Analysis LISREL	Four factors: instructor characteristics (attitude towards and control of the technology, and teaching style), student characteristics (computer competency, interactive collaboration, and e-learning course content and design), technology (ease of access and infrastructure), and support.

(Source: Author compilation based on previous literature)

3.4 Critical Success Factors on E-Learning and Technology Acceptance

The main Critical Success Factor categories, investigated in previous studies can be grouped as follows;

1. Instructor Characteristics (Volery and Lord ,2000; Snoog *et al,* 2001; Choi *et al,* 2006; Eom *et al*, 2006 ; Selim, 2007).
2. Student Characteristics (Volery and Lord ,2000; Snoog *et al,* 2001; Eom *et al*, 2006 ; Selim, 2007)
3. Technology (Volery and Lord ,2000; Selim, 2007)
4. Support (Selim, 2007)
5. Perceived Usefulness (Adams *et al*,1992 ; Teo, 2001; Ikart, 2005)
6. Perceived Ease Of Use (Adams *et al*,1992 ; Teo, 2001; Ikart, 2005)
7. Attitudes (Ikart ,2005; Choi *et al,* 2006)

3.4.1. Instructor Characteristics

Today, learning is a more learner centered and independent process. Even though students are empowered with more freedom and collaborative activities, teachers or instructors still play an important role. "As for all educational endeavors, the instructor plays a central role in the effectiveness and success of e-learning based courses" (Selim, 2007 p.398). According to some authors, it is not Information Technology it self, but the instructional implementation of IT that determines the effectiveness of e-learning (Volery & Lord, 2000). Not like conventional teaching, e-learning environments demand a transition of the role of students and the instructors (Eom *et al*, 2006). The instructor's role should be similar to a facilitator who stimulates, guides, and challenges students by providing them with freedom and responsibilities, rather than delivering all the instruction like a conventional lecturer.

Previous literature provides different instructor characteristics which influence the learning outcome in the e-learning environment. Volery and Lord (2000), identified three basic factors related to the instructor which influence the effectiveness of online education. These factors included attitude towards students, technical competence and

interaction. Soong *et al* (2001) believed that the instructor's activities were a composite of making the online resources

interesting, contributing to web forums and including reference materials online and abilities that might include high interaction skills and high motivational skills and these had an impact on online education. According to Eom *et al*. (2006), instructor knowledge and facilitation, interaction and feedback significantly influenced the students satisfaction in university online education. As described by Selim (2006), instructor attitudes towards and control of the technology and teaching style are two Critical Success Factors of e-learning acceptance.

3.4.2. Student Characteristics

Students are the primary participants of learning systems. Web based e-learning systems placed more responsibilities on learners than traditional face-to-face learning systems (Eom *et al*, 2006). According to them a different learning strategy and self-regulated learning, is necessary for e-learning systems to be effective. In other words e-learning is a self-regulated learning system which requires changing the roles of students from passive learners to active learners. Today university students are becoming more diverse and the demand for e-learning based courses is increasing (Volery & Lord, 2000). As described by Selim (2007), students need to have time management, discipline, and computer skills in order to be successful in the e-learning era.

A variety of student characteristics with potential influence on technology based learning can be identified in previous literature. Students' prior IT experience such as having a computer at home and attitudes towards the computer is critical to e-learning success (Selim, 2007). In addition to prior IT experience, gender and other demographic characters are likely to impact on the effectiveness of online education (Volery & Lord, 2000), who proposed that, the program or the course in which the student is enrolled also played a role in e-learning success. The majority research showed that women are less comfortable than men in dealing with computers (Sami & Pangannaiah, 2006). Eom *et al*.(2006) found that the students self motivation and learning style is critical to the success of online education.

3.4.3 Technology

The explosion in IT caused many changes in education. E-Resources integration into university education and e-learning is therefore the engine that drives the revolution in education. According to Selim (2007),

> "the efficient and effective use of IT in delivering e-learning based components of a course is of critical importance to the success and student acceptance of e-learning" (p.399).

Selim (2007) also said that it is important to ensure the university IT infrastructure is rich, reliable and capable of providing the courses with the necessary tools to make the delivery process as smooth as possible which is critical to the success of e-learning. As reported by Soong *et al*. (2001), projects which involved the use of IT in teaching and learning that were not successful in achieving the desired learning outcome share a common feature of not having ample access to technological advice, expertise and support. They also emphasized that if the IT infrastructure or technical support is lacking, e-resources will not be well made use of.

The IT infrastructure should include all the facilities such as network bandwidth, network security, network accessibility, audio and video plug-ins, courseware authoring applications, Internet availability, instructional multimedia services, videoconferencing, course management systems, and the user interface. In particular, a network set up should allow for both synchronous and asynchronous exchange of data, convenient access and minimum time for document delivery (Volery & Lord, 2000). Selim (2007) identified two Critical Success Factors regarding the technology for online course acceptance. Those were ease of access and the IT infrastructure. According to Volery and Lord (2000), ease of access and navigation, interface and interaction were the Critical Success factors for e-learning.

3.4.4 Support

The university and the library support play an important role in providing an effective and efficient e-resource service for students. The university administration is responsible

for developing and maintaining a quality and reliable IT infrastructure, while the library and staff should support it's users by providing necessary awareness and training on use of the e-resource. As stated by Renwick (2005, p. 22) "the library plays a leading role in faculty-library relationship and in instructional services such as orientation and training in use of library resources". Further, he motioned that efficient and effective use of e-resources can be made by increasing both intensity and coverage of user training programs. According to Damayanthi (2006), the major problems associated with the e-resource usage in the University of Peradeniya was lack of computers, inadequate publicity, lack of internet facility and low bandwidth and lack of awareness of users on e-resources. A similar response was observed by Punchihewa and Jayasuriya (2008) in e-resource usage in the University of Moratuwa, who recommended that the library should provide more facilities such as computers, broad internet connections, printing facilities and more organized training programs in order to enhance the e-resource usage.

A critical factor in providing training and support in e-resource usage is the competency and knowledge of IT trained library staff. The ability of library staff to keep up to date is a dire necessity to support and handle students problems. As described by Punchihewa and Jayasuriya (2008),

> "librarians should take necessary actions to enhance the knowledge of the library staff regarding the online resources. Also the staff should be continuously trained to make a user-friendly environment to the users of the library"(p.146).

3.4.5 Perceived Usefulness

The Technology Acceptance Model (TAM), introduced by Davis (1989) combines two concepts, Perceived Usefulness and Perceived Ease of Use with attitudes to explain and predict user's computer usage behavior. These two concepts were hypothesized to be fundamental determinants of user acceptance of information technology (Adams *et al,* 1992). These measures were also used by researchers to understand the factors that influence the success of information systems. According to Adams *et al.* (1992), these concepts were used in studies within and across organizations by researchers to

understand the diffusion of information technology and determinants of information technology adoption.

Perceived Usefulness is defined as the user's perception that the subjective probability of their using a specific system will increase his or her performance in an organizational context (Sami & Pangannaiah, 2006). Previous research has found that Perceived Usefulness has a strong and consistent relationship with computer usage (Teo, 2001). As explained by Davis (1989), Perceived Usefulness significantly correlated with both self-reported current usage and self-predicted future usage. Adams *et al* (1992), also confirmed that it is positively related to system usage. A possible reason for this relation is that individuals will use computers only if they perceived that such usage will help them to achieve a desired task performance.

3.4.6 Perceived Ease of Use

Perceived Ease of Use refers to the degree to which a user expects the target system to be free of effort (Sami & Pangannaiah, 2006). In other words it is the degree to which a user expects the use of the system to be user friendly (Teo, 2001). Past research has generally confirmed that perceived ease of use can directly influence computer usage (Davis, 1989). In general, if a system is easy to use, it requires minimum effort on the part of the users and increases its adaptability and usage. Conversely if the system is more complex and difficult to use, user's are less likely to be adopted (Teo, 2001).

3.4.7 Attitudes

The Theory of Reasoned Action (TRA) and Technology Acceptance Model (TAM) provide a theoretical foundation for measuring beliefs and attitudes to predict future behavior (Sami & Pangannaiah, 2006). According to TRA, a person's performance of a specified behavior is determined by his or her behavioral intention to perform this behavior, and behavioral intention is jointly determined by the person's attitude and subjective norm. Behavioral intention is a measure of one's intention to perform a specified behavior and attitude represents an individual's feelings about performing the

behavior (Ajzen & Fishbein, 1977 cited in Sami & Pangannaiah, 2006). According to Lau and Woods (2007), perceived usefulness and perceived ease of use are posited as having a significant impact on the user's attitude towards using a system.

Previous research has used attitude as a major factor in measuring user acceptance and real usage of information systems (Ikart, 2005; Choi *et al*,2007; Lau & Wood, 2007). As described by Choi *et al.* (2007) "a person will have a more positive attitude towards performing an action if he or she believes it will have major consequences and that these will be good"(p.227).

3.5 Summary

This chapter reviewed the related research works on e-resource based learning. Contextual review started with studies on factors affecting e-learning. Critical Success Factors for e-learning were investigated by a number of authors. Secondly, it discussed studies on factors affecting on acceptance and usage of IT as those were important in identifying individual behavior on new technology. Finally, it discussed the common Critical Success Factor categories which are identified by different authors.

The important fact that emerged in the review was that, there was no study on factors affecting e-resource based learning. There were enough research on usage of e-resources in higher educational institutes and some of these studies discussed factors for high usage of e-resources. There were a number of studies on Critical Success Factors on e-learning. Most of these studies identified factors like instructor characteristics, student characteristics, course content, technology infrastructure and university support as critical success factors in conducting successful e-learning program.

It is also important to note that some of the research were based on theories of technology acceptance, adoption and usage. These theories helped to understand human psychology and behavior on new technologies. Most studies used theories to describe human factors as that are unique to any sort of study while other external factors will depend on the organizational environment.

As there was no particular study on Critical Success Factors on e-resourced based learning, the present study had to combine literature on the theories of technology acceptance to investigate psychological factors with literature on e- resource usage and e-learning to identify other social, cultural and technological factors. The Critical Success Factors drawn from the literature review consist of psychological factors such as Perceived Usefulness, Perceived Ease of Use and Attitudes and other social, cultural and technological factors such as Instructor, Student Characters, Technology and Support.

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Chapter 4

Research Methodology

4.1 Introduction

The chapter presents the methods and data analysis techniques used for the study. First, it presents the target population under two groups; as e-resource users and e-resource managers. Then it discusses the sampling techniques and sample size for each population group. Finally, the chapter presents data collection methods and analysis techniques.

4.2 Research Approach and Methods

The research used a quantitative approach to identify Critical Success Factors on e-resource based learning on user perception. A qualitative approach was used to explore the CSFs on manager perception. The study was conducted as a case study as it focused on an instance of a particular phenomenon with a view to provide an in-depth account of events. The University of Colombo was selected for the case study since it provides e-resources for it's staff and students and acts as the focal point of PERI and SIDA project. The survey method was adopted in this research as it allows the researcher to gather information about a target population without undertaking complete enumeration. The methodology was developed after an intensive literature review.

4.3 Population

The target user population considered in this study was library users who use e-resources provided by the Library system of the University of Colombo for academic and research purposes. The University has provided the facilities to access e-resources at different levels for different users. Academic staff can access e-resources personally in their respective departments while students can use e-resources in their faculty computer labs, as well as, in the Main Library and Branch Libraries.

The University Library system provides different types of e-resources as indicated below;

1. In-House e-resources – accessed within the Library
2. IP Authenticated e-resources – accessed within the University premises

3. E-Resources with remote access – accessed remotely using usernames and passwords.

Since undergraduate students, postgraduate students and academic staff of University of Colombo can use e-resources within the university or remotely, these three user groups were taken as the elements of population (Table 4.3). The entire population belongs to seven faculties as indicated below;

Faculties of – Arts
Education
Law
Medicine
Science
Management and Finance
Graduate Studies

Under the Main Library there are two Branch Libraries. The Main Library caters five faculties including Arts, Education, Graduate Studies, Law and Management and Finance. Two branch Libraries, Science and Medicine cater to their respective faculties. The Sripali Campus and all institutes affiliated to the University of Colombo were excluded from the study since those staff and students have no access to the library system and e-resources.

Table 4.3 Total Population

Faculty	Undergraduates	Postgraduates	Academic Staff
Arts	3157	147	123
Education	333	1438	26
Law	1003	49	28
Medicine	1502	00	114
Science	1869	124	95
Management and Finance	1964	299	50
Graduate Studies	00	573	00
Total	**9828**	**2630**	**436**

(Source: Examination Branch, University of Colombo
Sri Lanka University Statistics, 2007)

The target e-resource managers consisted of 13 professional library staff of the University of Colombo which included the Librarian, six Senior Assistant Librarians and six Assistant Librarians.

4.4 Sample

Sampling is one of the most crucial steps in survey research. The primary purpose of sampling is to select elements that accurately represent the total population from which the elements were drawn. As the study utilizes the basis of a survey method for data collection, it is important to select a representative sample. Therefore, randomization is employed to select an unbiased sample. Random sampling gives each element in the population an equal chance of being included in the sample.

The population considered for the study was more heterogeneous. Hence, it was decided to select a sample using a Stratified Random Sampling Method. This method reduces sampling error and allows the comparison of different strata or subgroups. It is important to define strata in such way that each element appears in only one stratum. The study population was initially divided into three subgroups; namely undergraduate students and postgraduate students and academic staff. Individuals within each sub group were further stratified according to their faculties, academic year and academic status. The Purposive Sampling Method was used to select the sample from e-resource managers.

The sample was calculated using the table developed by Krejcie and Morgan (1970). The table was developed using a proportional allocation formula based on the assumption that a characteristic occurred 50% of the time (Powell & Connaway, 2004).

4.4.1 Undergraduate Students of the University of Colombo

For the selection of a research sample of undergraduate students, the first stratification was based on faculties and from each faculty, it was further stratified as a selection based on second, third, fourth and fifth year students. The total sample was calculated using the

table for determination of sample size developed by Krejcie and Morgan (1970) and it was divided into subgroups according to the percentage. The population and sample are shown in Table 4.4.1. It is important to note that students only from the second year upward were considered for the study. The first year students were excluded from the sampling frame, since they are new comers. Generally they have less awareness on library services and e-resources.

Table 4.4.1 Distribution of Research Sample of Undergraduates by Faculties of University of Colombo.

Faculty	Total population		Number of students in the sample
	Academic Year	**Total No. of Students**	
Arts	Second year	1351	64
	Third year	600	28
	Fourth year	461	23
	Total	**2412**	**115**
Education	Second year	115	5
	Third year	145	7
	Fourth year	73	4
	Total	**333**	**16**
Law	Second year	409	20
	Third year	202	10
	Fourth year	195	9
	Total	**806**	**39**
Medicine	Second year	214	10
	Third year	248	12
	Fourth year	195	9
	Fifth Year	406	20
	Total	**1063**	**51**
Science	Second year	970	46
	Third year	370	18
	Fourth year	129	6
	Total	**1469**	**70**

Management Studies	Second year	795	38
	Third year	391	19
	Fourth year	390	19
	Total	**1576**	**76**
Total		**7659**	**367**

(Source: Author compilation based on statistics from Examination Branch, University of Colombo)

4.4.2 Postgraduate Students of the University of Colombo

Postgraduate students registered for the academic year 2007/2008 and 2008/2009 were considered for the study, including Faculty of Graduate Studies (Table 4.4.2.). They were stratified based on the faculties. The total sample was calculated using the table for determination of sample size which was developed by Krejcie and Morgan (1970) and it was divided into subgroups according to the percentage.

There were no registered postgraduate students in the Faculty of Medicine for the two respective academic years. Medical postgraduate degrees are basically conducted by the Postgraduate Institute of Medicine (PGIM), which was excluded from the sampling frame since it is an affiliated institute of the University of Colombo. It is important to note that the Faculty of Education conducts several postgraduate diploma courses during weekends. Since these are part time courses, the majority of students do not register in the university library and according to counter statistics their interest on e-resources is very low. Therefore, only postgraduate students, who follow masters' degrees and doctoral degrees were selected for the study.

Table 4.4.2. **Distribution of Research Sample of Postgraduates by Faculties of University of Colombo**

Faculty	Total No. of Students	No. of students in the sample
Arts	147	31
Education	262	54
Law	49	10

Science	124	25
Management Studies	299	63
Graduate Studies	573	119
Total	**1454**	**302**

(Source : Author compilation based on the statistics from Examination Branch and Faculty of Graduate Studies University of Colombo)

4.4.3 Academic Staff of the University of Colombo

The academic staff was first stratified according to the faculties and within each faculty, they were subjected to further stratification based on their academic status such as Professor/Associate Professor, Senior Lecturer, and Lecturer/Probationary Lecturer (Table 4.4.3.). The total sample was calculated using the table for determination of sample size developed by Krejcie and Morgan (1970) and it was divided into subgroups according to the percentage. Temporary staff was not considered in the study.

Table 4.4.3 Distribution of Research Sample of Academic Staff by Faculties of University of Colombo

(Staff on 01.01.2008)

Faculty	Professor / Associate Professor		Senior Lecturer		Lecturer / Lecturer Probationary	
	Total Population	Sample	Total Population	Sample	Total Population	Sample
Arts	26	13	66	31	31	15
Education	04	02	12	6	10	5
Law	01	00	14	7	13	6
Medicine	33	16	48	22	33	15
Science	17	08	56	26	22	10
Management Studies	01	00	28	13	21	10
Total	**82**	**39**	**224**	**105**	**130**	**61**
Grand total of the population					**436**	
Grand total of the sample					**205**	

(Source : Author compilation based on statistics from Academic Establishment Department, University of Colombo and

Sri Lanka University Statistics, 2007)

4.4.4 Total User Sample

The total user sample consisted of 367 undergraduate students, 302 postgraduate students and 205 academic staff as indicated in Table 4.4.4.

Table 4.4.4 Total Number of Individuals in the Research Sample by User Category

User category	No. of individuals in the sample
Undergraduate students	367
Postgraduate students	302
Academic staff	205
Total	**874**

4.4.5 E-Resource Managers of the University of Colombo

There were 13 professional library staff members in the library system, including the Librarian (Table 4.4.5). The Librarian and two Assistant Librarians in charge of the two faculty libraries were purposively selected for the study as e-resource managers. The sample included one Librarian, Senior Assistant Librarian and Assistant Librarian. Generally, budget handling, decision making and negotiation with publishers was done under the supervision of the Librarian. Hence, the Librarian was selected for the interview as the key person in e-resource management. Two Assistant Librarians were selected from faculty libraries in order to get a better view on those faculties.

Table 4.4.5. Population and the Sample of the Professional Library Staff

(Staff on 01. 01. 2008)

Library	Number of Librarians	Number of Senior Assistant Librarians	Number of Assistant Librarians	Total	Sample
Main Library	1	5	5	11	1

Medicine	-	1	-	1	1
Science	-	-	1	1	1
Total	**1**	**6**	**6**	**13**	**3**

(Sources: Author compilation based on statistics from Main Library, University of Colombo)

4. 5 Data Collection

Identification of variables in relation to e-resource based learning was done prior to the questionnaire development. A literature review and a focus group discussion were carried out to explore existing factors. The questionnaire was then developed based on the factors finalized by the focus group discussion.

4.5.1 Literature Review

A review of relevant literature was used to find out existing factors, that affect e-resource based learning. There was no study on factors affecting on e-resource based learning. Therefore, factor identification was done using studies with similar concepts such as e-learning, e-resource usage and technology acceptance. The identified factors and their variables are given in the Table A.1 (Appendix A).

4.5.2 Focus Group Discussion

A focus group discussion was carried out to investigate the suitability of identified variables for the concept of e-resource based learning and in the Sri Lankan university environment. Focus group discussions were useful for orienting one self to a new field, developing ideas and concepts and developing and refining research instrument (Powell & Connaway, 2004). Other than refining the identified variables, identification of new variables was also expected from the discussion. Ten members including all user groups participated in the discussion. The group included one Senior Lecturer from the Faculty of Management and two Probationary Lectures from the Faculty of Arts and the Faculty of Science as staff members. Postgraduates were represented by two postgraduate students from the Faculty of Graduate Studies and the Faculty of Science. Five undergraduate students representing three academic years and five faculties except the Faculty of Medicine were included in the group. An introductory description was given

to emphasize the concepts such as e-resources and e-resource based learning and the objectives of the study. Members were provided with a list of variables identified from literature and asked to comment on these variables. Meantime they were asked to propose new variables which affect e-resource based learning. Refined variables were listed and rewritten to suit the concept of e-resourced based learning and used in the development of the questionnaire.

4.5.3 Questionnaire

The main research tool for data collection for this study was the questionnaires. Questionnaires are proven to be the best research instrument used in survey research and it allows the collection of a large amount of data in a relatively short period of time (Powel & Connaway, 2004). The research used the same questionnaire with minor changes for all three user groups, namely the undergraduates, the postgraduates and the academic staff (Appendix C and D). Basically, the questionnaire was designed under the following sections.

Section A : Factors affecting e-resource based learning

Section B : E-Resource usage

Section C : Background information

Section A targeted specific CSFs on e-resource based learning. The section consisted of forty five questions based on variables which were built using a literature review and the focus group discussion (Table 4.5.3). These variables were categorized under seven dimensions. All the questions were structured and close ended on a five point Liket's scale. Users were instructed to select the most suitable response from the scale. All the statements used in this section were favorable (positive), so that the scale indicate meaning as follows,

1. Strongly Disagree (SD)
2. Disagree (D)
3. Uncertain (U)
4. Agree (A)
5. Strongly Agree (SA).

Four variables (Q1-Q4) adopted from Adams *et al.* (1992) were used to measure the perceived usefulness of e-resources on university learning. Perceived ease of use was captured by five variables (Q5-Q9) which were developed by Adams *et al* (1992).Three out of four variables (Q10-Q12) developed to capture user's attitudes towards e-resource usage were adopted from Choi *et al* (2006) and the last item (Q13) was developed from the focus group discussion.

Eleven variables (Q14-Q24) were used in assessing student characteristics such as computer competency and information literacy. Out of eleven, the first eight variables were adopted from (Snoog *et al* 2001).Three additional indicators were developed from the focus group discussion. Lecturer characteristics were tested with three variables (Q25-Q27) developed by Volery and Lord (2000). It has to be noted that the questionnaire for the academic staff did not contain a dimension of lecturer characteristics.

Nine variables (Q28-Q36) were developed to measure technology reliability, richness, consistency and effectiveness of the university. These variables were adopted from Volery and Lord (2000). The university support section consisted of 9 items. Four items (Q37,Q38, Q41,Q42) were adopted from Selim (2007), while others were developed from the focus group discussion. These variables captured the effectiveness and efficiency of the library support and its services.

Section B consisted of seven questions, in which the first five were structured and close-ended and the rest were open ended. The first question was aimed on use or non use of e-resources by respondents. The second and third questions were on frequency of e-resource usage. The fourth question was focused on how they have learnt to use e-resource. The last close ended question was on means of access the e-resources. The other two questions were targeted on getting information on problems encountered in e-resource based learning and suggestion to improve e-resource usage.

Section C collected user demographic information. It has to be noted that, as the demographic information of academic staff was different from that of the student, section C was altered when required (Appendix D).

Data collection was carried out in November and December 2008. Questionnaires with an accompanying letter (Appendix B) explaining the objective of the study were distributed randomly to the Undergraduates and Postgraduates who visited the Main Library and the Faculty Libraries. Questionnaires were sent by post with self-addressed stamped envelopes to Postgraduates who were not frequent library users. Data collection from Academic Staff was done by distributing questionnaires through the internal mail system of the University of Colombo., reminders were sent to obtain a higher response rate. Telephone conversations, e-mails and personal visits were used for this purpose.

Table 4.5.3 Variables and Dimensions Used in the Questionnaire

Dimension	**Variables**	**Description**
Perceived Usefulness	Q1. Usefulness Q2. Learning performance Q3. Learning effectiveness Q4. Promptness	Usefulness of e-resource in learning E-Resources increase learning performance E-Resources increase learning effectiveness Promptness of e-resources than conventional information sources
Perceived Ease of Use	Q5. Ease of use Q6. Understandability Q7. Ease of becoming skillful Q8 Ease of learning Q9. Controllability	Ease of use of e-resources Understandability of interaction with e-resources Ease of becoming skilful in using Ease of learning to use Controllability of e-resource
Attitudes	Q10. Wise idea Q11. Likeability Q12. Pleasantness Q13. Prestige	Using e-resource is a wise idea Likeability of the idea of using e-resource Pleasantness of using Prestige of using

User Computer Competency	Q14. Encouragement of searching information Q15. Enjoyment of using PC Q16. Use of PCs for work and play Q17. Comfort of using computers and software Q18. Previous experience Q19. Fearlessness Q20. Ease of navigation Q21. Having Internet access at home Q22. Searching ability Q23. Search results Q24.Confidence in searching information	Encouragement of searching more information than traditional resources Enjoyment of using personal computers Use of personal computers for work and play Comfort of using computers and software before using e-resources Helpfulness of previous experience Not afraid of using e-resources Ease of navigation through e-resources Internet Access at home Ability to search information in e-resources Satisfaction of Search results Confidence in searching information using e-resources
Lecturer Characteristics	Q25. Encourage and motivate Q26. Ability to explain the importance Q27. Reference lists	Lecturers encourage and motivate to use e-resources Ability of the lecturer to explain the importance Providence of reference lists
Technology	Q28. On-Campus access Q29. Ease of browsing Q30. Browsing speed Q31. Ease of use of the library website Q32. Information on the website Q33. Availability of usernames/passwords Q34. Usability of computer labs Q35. Reliability of the computer network Q36. IT infrastructure	Ease of On-Campus access Ease of browsing e-resources Satisfaction of browsing speed Ease of use of the library website Helpfulness of the information on the library website in using e-resources Availability of username/password through intranet Usability of computers in laboratory to access e-resources Reliability of the computer network in the University Efficiency of University IT infrastructure
University Support	Q37. Remote access Q38. Technical support Q39. Knowledgeable library staff Q40. Supportiveness of library staff Q41. Availability of computers Q42. Printing facility Q43. Awareness Q44. Training/ orientation programs Q45. Helpfulness of Librarians	Ability access e-resources remotely Technical support from library staff Knowledge of library staff about e-resources Supportiveness of library staff for e-resource users Availability of enough computers Availability of printing facility Awareness about available resources Helpfulness of Training/ orientation programs Helpfulness of Librarians in using e-resources

(Source: Author compilation based on literature review and focus group discussion)

4.5.4 Interviews

Three interviews were carried out with the Librarian, Senior Assistant Librarian of the Medical Library and the Assistant Librarian of the Science Library, in order to investigate CSFs on e-recourse based learning on the mangers' perception. Interviews were recorded for further discussion. When in doubt, clarification was sort out by personally contacting the interviewees.

4.6 Data Analysis

The collected data from the questionnaires were coded and entered on work sheets of SPSS (Statistical Package for Social Science) Version 13.00 for windows computer package. Factor analysis, multiple regression analysis and other tests were carried out using the same package occupies a variety of statistical techniques.

4.6.1 Factor analysis

Factor analysis was conducted to identify the CSF on e-resource based learning. The Principle Component Extraction and Varimax with Kaiser Normalization rotation methods were employed for the analysis. The Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin (KMO statistics) measure of sampling adequacy were used to assess whether the data was suitable for analysis. Factor validity and reliability was expressed by Cronbach's alpha.

4.6.2 Multiple Regression Analysis

The general purpose of multiple regression analysis is to learn about the relationship between several independent or predictor variables and a dependent variable (Chan and Tam, 2000). The present study carried out a multiple regression analysis to determine the relationship between identified CSFs on e-resource based learning and an overall e-resource usage in the University of Colombo. The standard form of the multiple regression equation for the variables in this study was as follows;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots\ldots\ldots \beta_n X_n + Є$$

Y= Dependent Variable

X= Independent Variables (Predictors)

n = Number of Independent Variables

β = Regression Coefficient

Є= Error assumed to be random and normality distributed with equal variances at every predictor

The analysis used a Model Summary, Analysis of Variance (ANOVA) and Residual Statistics. The multiple regression analysis was based on following assumptions;

1. Independence of observations – Every observation in the sample is assumed to be independent of all other observations.
2. Assumption of Linearity – Assumes that the independent variables are all linearly related to the dependent variable. In practice this assumption can virtually never be confirmed because of multiple regression procedures which are not greatly affected by minor deviations from this assumption (Ikart, 2004).
3. Normality – Assumes that from the population, for each combination of values of the independent variables, the residuals are normally distributed.
4. Equal variance (homoscedasticity) – Assumes that in the population for each combination of values of independent variables the distribution of residuals has same spread.

4.6.3 Analysis of Variance (ANOVA)

One Way ANOVA were conducted to find out any significant differences on e-resource usage between different user categories, faculties, age groups and sex.

4.7 Summary

The chapter presented the research approach, population, sample, data collection methods and data analysis techniques. The user sample consisted of 367 undergraduates, 302

postgraduates and 205 academic staff while three librarians were included as managers. Stratified Random Sampling and Purposive Sampling methods were employed to select the sample from the user population and from the managers respectively. Questionnaires and interviews were the basic data collection methods for the study while the factor analysis and regression analysis were utilized to interpret data.

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