The development and evaluation of an online tutorial to teach digitization and metadata indexing of library and archival resources

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Abstract

The aim of the study was to evaluate an online tutorial designed to teach digitization and metadata indexing of library and archival resources. The online tutorial was designed according to constructivist teaching principles to promote collaborative learning. The tutorial was hosted on the OLS (Open learning System) of the University of KwaZulu-Natal (UKZN).

The research was concerned with answering three research questions:

- Is the online tutorial a teaching instrument capable of teaching metadata indexing and digitization skills?

- Is the online tutorial an effective teaching tool?

- Does the use of constructivist teaching elements in the tutorial design allow for a more effective communication of knowledge and skills?

A total of 10 participants registered for and took part in the online tutorial. On completion of the tutorial a qualitative and quantitative evaluation of the tutorial was done. In terms of the latter a self-administered questionnaire was used as the data collection technique.

The qualitative evaluation was done via an analysis of discussions on the discussion forum and e-mail correspondence between learners and the researcher during the running of the tutorial. A more quantitative analysis was then conducted of the responses to the self-administered questionnaire.

The qualitative and quantitative analysis identified significant issues that affected the running of the online tutorial. The main issues included problems relating to Internet access to the online tutorial, participation of learners on the tutorial and the functioning of the online learning environment.

The analysis of the results of the evaluation provided answers for the three research questions. The analysis found that the online tutorial was able to teach metadata indexing and digitization skills. This was based on completed work that was submitted by participants and responses participants gave to questions on the post-course questionnaire. However, the amount of work submitted by all participants for the metadata indexing and digitization exercises was generally low.

The online tutorial was able to conduct effective teaching at certain times in the tutorial. However, there were a number of issues that disrupted the functioning of the online tutorial and this limited the effectiveness of teaching on the tutorial.

The use of constructivist teaching elements in the tutorial design was unable to enable effective communication of knowledge and skills and the promotion of constructivist learning on the tutorial. This goal was hampered by various problems associated with the hosting of the online tutorial and Internet connectivity to the OLS site.

Various suggestions for further research were made.

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List of abbreviations and acronyms

CDP   Colorado Digitization Project
DCMI   Dublin Core Metadata Initiative
DISA   Digital Imaging Project of South Africa
IFLA   International Federation of Library Associations
ITD   Information Technology Division, University of Kwa-Zulu-Natal
ITED   Information Technology Education Department, University of Kwa-Zulu-Natal
LIS   Library and information science
MOODLE   Modular Object-Oriented Dynamic Learning Environment
NCSI   National Centre for Science Information, Bangalore, India
TEI   Text Encoding Initiative
OLS   Open Learning System
UKZN   University of Kwa-Zulu-Natal
WBL   Web based learning

Chapter 1 – Introduction to the study

1.1 Introduction
This chapter will begin by investigating the growth of the Internet and computer technologies worldwide and the impact that this has had on the library and archival profession. The chapter will then show how librarians and archivists now use the Internet to conduct their work.

The discussion will then focus on the growth of digital libraries which is linked to the growth of the Internet. The growth in the number of digital libraries is due to the huge volume of print resources that have been digitized and hosted on the Internet. This is followed by a discussion of the Digital Imaging Project of South Africa (DISA).

The research problem will then be identified as the need to teach digitization and metadata indexing skills in an online learning environment using constructivist teaching principles. Both these concepts are introduced and discussed. This is followed by a discussion on web-based learning. A brief look at the OLS (Open Learning System) which is the online learning platform on which the DISA online tutorial will be hosted will follow this. The research questions will be noted. A justification for these questions will be provided and this will be followed by the rationale for conducting the research.

A theoretical perspective has to be used to design the tutorial to teach these skills online. Three important theories of learning will be discussed but the focus will be placed on the constructivist learning theory which was chosen for the design of the DISA online tutorial. The development of online training programs to teach digital librarian digitization skills will then be discussed.

The limitations that the research faced will be noted and will be followed with a summary of the rest of the chapters of the thesis. Many of the relevant issues pertaining to this research are introduced in this introductory chapter. A more elaborate discussion of the relevant issues will be provided in the literature review in Chapter 2.

1.2 The growth of the Internet and computer technologies
Technological changes had major impacts on the library and archival professions. More functions of libraries and archives have been taken over by technology. Librarians and archivists have to be open to changes in the way libraries now operate. Reluctance to adapt will hamper a particular library or archive from providing services relevant to the needs of present day users. As Low (1991) points out:

> Society is forever changing, politically, socially and technologically. We work in this ever-changing environment on a daily basis. As librarians we must keep abreast of all these changes. We must have a basic knowledge of current technologies so that we can apply and implement these technologies in our libraries. As information professionals we need a broad knowledge of current and emerging technologies to enable us to collect and provide access to

information in these areas. All of this information must be constantly updated for us to be able to ensure the existence of libraries in the 21st century.

Adapting to new computer technologies is vital for success in the modern world. The electronic revolution and improvements in communication make it important for libraries to prepare for future technological changes. The electronic revolution has closed the gap between print and electronic resources.Technological developments occur daily and the work of libraries and archives is influenced by this. Thus modern computing network technologies have had a profound effect on the way libraries now operate. As Lynch (2000) notes:

> Networked libraries were the foundation for sharing of library resources. The sharing of resources amongst networked libraries was in conjunction with the development of the World Wide Web. A number of the essential functions of libraries were affected by these changes.

Network technologies now enable libraries to communicate and share resources with each other as telecommunication facilities grow more sophisticated and efficient. Saunders (1999) supports this view stating "Telecommunications and networking play a central role in the evolving virtual library. The network is the centerpiece that links servers and end users. Without a network there is no virtual library". Networking has been a significant influence in the computerization of library and archival services and has contributed to the growth and functions of these services.

The Internet has influenced society at large and will undoubtedly influence library work in the future. Sreenivasulu (2000:18) argued that:

> The Internet will become a significant force in the information world. If work becomes decentralized and teleworking becomes the norm, we are going to have virtual libraries, with a vast increase in the range and variety of digital information resources.

What Sreenivasulu foresaw has become a reality: the Internet is used by many libraries to conduct many of their activities. Libraries have benefited immensely from the use of the Internet to conduct library work. The World Wide Web and the Internet are now key instruments through which library academic research takes place.

> The World Wide Web holds millions of websites and the Internet is the market place for research, teaching, expression, publication and communication of information. Libraries and archives are society's primary information providers and were early users of the new digital technology with respect to cataloguing and processing management, and later for providing information on their collections to the www-community (UNESCO, 2002).

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Many libraries have used computer technologies available to digitize their collections and host them on the Internet thus giving birth to digital libraries.

1.3 The evolution of digital libraries

The digital library is a new type of library that fulfills the same role as traditional libraries that is, providing access to information resources. According to Waters (1998):

> Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities.

Towards the latter part of the twentieth century libraries acquired the use of electronic cataloguing systems and networked electronic bibliographic databases. These computerized functions are now part of library and archival work. Many other technological innovations have since been introduced to enhance library and archival work and many more will be introduced in the future. As Keys (1999) notes:

> We are building the virtual library of the future within the shell of the library of today. What is happening in the most advanced libraries now will become common practice across all types of libraries within fifteen years. This will occur within the same way that the adoption of OPAC's and local systems, advanced telecommunications, and electronic resources (first introduced by advanced libraries beginning in the early 1980s) became the basic expectations of all libraries by the late 1990s.

Digital libraries are the result of the evolution of libraries from bibliographic collections housed in fixed physical locations to bibliographic collections in digital formats housed on the Internet. They are a response to changes driven by information technology.

A digital library (also referred to as a "virtual library" (Saunders, 1999:2) – see "Definitions of terms" below) has its own challenges and limitations. These challenges are found in the form of legal and administrative issues with which digital libraries have to deal with in their daily operations.

> An increasingly complex technological, social, legal, and economic environment defines many boundaries within which "digital library" services will evolve. Librarians may discover that "libraries-without-walls" are actually only libraries with new walls technologically bounded, legally restricted, and administratively hamstrung (Terry and Cleveland, 1998).

Digital libraries are different from traditional library services in that they have their own unique structures and use a variety of new technologies to provide information resources.

> Far from emulating the organization of conventional libraries, the organization and structure of digital libraries, and the division of labor within them, are open to considerable experimentation (Waters, 1998).

The growth of digital libraries creates a need for print materials and images to be digitized and indexed before they are hosted on the Internet. Therefore digitisation and metadata indexing skills are needed as more library and archival institutions are housing electronic and Internet-based information resources.

1.4 Training digital librarians

The development of learning programs to train digital librarians has become a necessity. The emergence of digital libraries requires a new breed of librarian which requires different methods of training. The design of e-learning programs to teach digital librarians will need to focus on specific technical skills when necessary to equip a librarian to work in a digital library environment.

> Digital libraries are first and foremost *libraries*, and, as such, any model curriculum should maintain a core set of courses that address the major functions and activities of libraries in general, in both digital and traditional forms. At the same time, courses explicitly focusing on technology for digital libraries should strive to connect specific technical applications to the library environment (Spink, 1999).

Librarians and archivists need to possess unique skills to work in the digital information world. "Now, in addition to their traditional library skills and knowledge, many of today's professional librarians are expected to possess additional knowledge and skills required for work within the digital information world" (Tennant, 2002).

The lack of effective digital library training in some areas is pointed out by Intner, Lazinger and Weihs (2006).These authors note that:

> Among the skills needed for effectiveness in the digital environment are a good many not taught in library school courses, such as leadership, entrepreneurship, costing and pricing products and marketing.These skills seem more likely to be taught in business school than on preparing librarians and information specialists.

A digital librarian needs to possess certain skills which entitles him or her to be regarded as a digital librarian.

> The competency of a digital librarian is represented by different sets of skills, attitudes and values that enable a digital librarian to work as digital information professional or digital knowledge worker and digital knowledge communicator (Sreenivasulu, 2000).

Developing formal teaching programs to train librarians in digitization and metadata indexing skills is needed. Library education programs have to cater to the needs of a new type of library worker.

> The needs of DL [digital library] education present two main aspects: one is the need to emphasize skills and competencies, such as communication skills and trend analysis; the other addresses the need to further develop the technical and information skills for practical and operational understanding of digital libraries (Choi and Rasmussen, 2006).

King (2006) believes that traditional informal methods used to teach librarians computer skills need to be revised. The emergence of digital libraries will require more formalized training programs to be developed for aspiring digital librarians.

> Traditionally, library staff had been trained on a "need-to-know" basis, with initial training concerning basic library procedures, such as circulation, with additional training occurring as and when it is needed; for example, training in the use of a new catalogue or management system. With the advent of emergent ICTs however, staff needed to be trained in the use of CD-ROMs, the internet, and other related products (King, 2006).

The purpose of the online tutorial which formed the focus of this research will be to assist participants to develop skills needed to gain competence in metadata indexing and digitization of historical documents hosted on the DISA project website.

1.5 Digital Imaging Project of South Africa (DISA)

A number of virtual library collections have developed all over the world. DISA is a virtual library collection that has developed in South Africa. DISA hosts digitized journals, pamphlets and other published literature covering the South African socio-political struggle prior to the first democratic elections in South Africa in 1994.

DISA is a non-profit making initiative intended to foster co-operation among research libraries and archives in Southern Africa, sponsored by the Andrew Mellon Foundation.

The mission of the DISA Project is to undertake a digital imaging project in South Africa that will result in important South African historical material becoming easily and universally accessible, while at the same time developing knowledge and expertise in digital imaging technology for the library and archival community in South Africa (Peters and Pickover, 2001).

There are a number of research collections which have been digitized and placed on the Internet for various reasons. The three more common reasons are found in the UNESCO guidelines of 2002:

- To increase access. This is the most obvious and primary reason; where there is thought to be a high demand from users, the library or archive has the desire to

increase access to a specific collection
- To reduce the handling and use of fragile or heavily used original material, and to create a "back-up" copy for endangered material
- To give the institution opportunities for the development of its technical infrastructure and staff skill capacity (UNESCO, 2002).

The DISA Project realized that library and archival institutions in South and Southern Africa needed to be on a par with the rest of the world in developing digitizing and metadata indexing. To achieve this objective the DISA Project aimed to be as technologically advanced as other international digitization projects in order to achieve international standards.

An objective of the DISA Project is to promote and develop research and scholarship into digitization in South and Southern Africa. DISA staff has contributed a number of studies on digitization and metadata indexing (Peters and Pickover, 2001).

The DISA Project has established partnerships with other digitization projects throughout the world. These partnerships promote the exchange of information on the latest developments in digitization and metadata indexing.

The Digital Imaging Project of South Africa (http://www.disa.ukzn.ac.za/) is a successful example of how a local initiative involving South African scholars, librarians and archivists, and drawing on international expertise but maintaining national control, can make available local resources to national and international scholars without removing the documents from their local context (Peters and Pickover, 2002).

One of the aims of the DISA Project is to provide assistance to staff at institutions throughout South Africa to digitize and index the material in their collections.The amount of research conducted on the teaching of digitization and metadata indexing in South Africa is limited. The training programs of major library training schools in South Africa are focused more on traditional library training. Library training programs should provide for an education in traditional librarianship as well as ICT knowledge and skills (Hoskins, 2005).

The DISA Project has initiated efforts to train South African librarians in digitization and metadata indexing skills. The DISA Project provides digital library training for institutions participating in developing the DISA collection. Some previous training for the DISA Project was conducted in the form of three-day workshops.

The development and assessment of a trial online course was mooted by the Information Technology Education Department (ITED) at the University of KwaZulu-Natal in conjunction with the DISA Project, as a research option for the Masters degree course. The proposed trial online course would provide an alternative method to previous training offered by DISA that was conducted in the form of a three-day workshop. It is with the development and assessment of such a course that the proposed study is concerned. The

need for a digitization and metadata indexing tutorial within a web-based environment is now a reality because computer technologies have influenced the way people are educated.

One of the reasons for the development of the proposed online tutorial was that the DISA face-to-face training programs offered were found to be too expensive to conduct. As Peters and Pickover (2001) points out, "While the interest in staff development is high in South Africa, financial constraints in light of demands for basic library services in remote areas have limited the development of digital library skills to the tertiary education sector and national institutions".

In contrast to face-to-face training, web-based training would offer some advantages. Two of the main advantages would be:

- The training would be provided over a longer period
- A tutor would be available for the duration of the course (Bell, 2007).

The development of this web-based tutorial would thus extend the DISA Project's goal of training library and archival staff in digitization and metadata indexing skills.

1.6 Description of the research problem

Given the discussion above the research problem which this study investigated was to ascertain if metadata indexing and digitization skills could be taught successfully in a web-based learning scenario, and if the use of constructivist teaching principles would encourage greater learning of these skills.

Metadata indexing and digitization

Metadata indexing can be described as the indexing of digital content on the Internet. Traditional library cataloguing and classification systems are not able to adequately classify and catalogue electronic resources, while metadata indexing is able to do this.

> Metadata addresses the issue of indexing large quantities of data of various types without requiring enormous amounts of network bandwidth. What gets indexed is the representational data rather than the information object itself (Xu, 1997).

The digitization process converts bibliographic resources of libraries and archives to be accessed in digital formats on the Internet.

> Digitization enables the preservation of and accessibility to library and archival information resources. Digitization is conducted to meet the demand for electronic versions of text and images that need to be hosted on the Internet. Digital technologies offer a new preservation paradigm (UNESCO, 2002).

Web-based learning

It is important to consider the growth of web-based learning and its influence on the education of librarians and archivists in the future. This is important because web-based

learning is playing a greater role in the training programs of all professions throughout the world. Libraries and archives also have to plan how to make effective use of web-based education to train library and archives staff.

> Web-based training is a powerful environment, one that can reshape the format of conventional instruction, such as textbooks and lectures. Indeed, Web-based training offers flexibility and cost efficiency of online end-user training and individual attention for supporting learner-controlled training (Liaw, 2002:56).

What is the status of online education offered by library and archival institutions? Although popular online education also faces teething problems, Spinnaze (cited in Perry 2005) believes future training programs in metadata indexing and digitization training will have to improve. She states that:

> Despite recent progress, there still exists a need to improve access to hands-on learning, mentoring, and continuing education, as well as formal education of a new generation of creators and managers of digital assets.

This leads to the question regarding the impact of online digitization training on library and archives training in general. Digitization has altered the way library training is conducted as Spink (1999) indicates:

> The development of a "digital libraries" track for information and computer science students that focuses on the technical and human aspects of the web and digital libraries seems inevitable. In the United States, several universities have reorganized existing library schools to emphasize digital information and online services.

In order to develop the proposed tutorial an online learning environment had to be used to host the proposed online tutorial. During the period between 2000 and 2003 the proprietary software system WebCT was used as course management tool for presentation of online courses at the University of KwaZulu-Natal (UKZN). In 2003 UKZN decided to replace the WebCT system with the Open learning System (OLS), an open source learning environment that would save on cost as well as provide an online learning system that was flexible and supported constructivist learning principles of teaching (Clarke and Amory, 2004). The OLS developed by ITED (Information Technology in Education Department), University of KwaZulu-Natal was chosen for the development of a web-based tutorial for the DISA Project. The DISA Project has a working partnership with the University of KwaZulu-Natal.

The OLS has been developed to provide a flexible open source teaching environment that supports a variety of teaching styles. ITED came to the realization that more participation from students was required when conducting online learning programmes. OLS was developed to facilitate a constructivist flexible online learning environment. The focus of OLS is on creating "authentic tasks" that create real work related environments. The OLS also provides communication tools that foster negotiation and discussion amongst students and lecturing staff (Clarke and Amory, 2004).

UKZN has since then decided to choose MOODLE (Modular Object-Oriented Dynamic Learning Environment) as their online learning management system. Some of the reasons the change was made are provided by Jackson (2008):

> It is limited in terms of being able to provide ongoing presentations, workshops and training to course facilitators. Where there is a complete lack, is in the provision for the future development of the OLS in keeping up with new technological and educational trends.

MOODLE has already been used as an online learning management system at UKZN. It already had a number of users, both module developers and students; this has made it a favourite to replace OLS.

1.7 Key research questions
Given the above problem, the key research questions that the study attempted to answer were as follows:

- Is the online tutorial a teaching instrument capable of teaching metadata indexing and digitization skills?
- Is the online tutorial an effective teaching tool?
- Does the use of constructivist teaching elements in the tutorial design allow for a more effective communication of knowledge and skills?

1.8 Rationale of the study
The study was conducted to evaluate the effectiveness of developing an online tutorial as a tool to teach metadata indexing and digitization (scanning) skills to library and archival staff. The tutorial that was designed would assist participants to develop the skills needed to gain competence in metadata indexing and digitization of historical documents of the Digital Innovation Project of South Africa (DISA).

It was considered necessary at this juncture to conduct a study relating to online learning for library and archival science. The Internet impacts on every facet of society and in order to use the opportunities and advantages offered by the Internet and online learning this study was considered a timely intervention.

This study will help ascertain if the online tutorial is a suitable alternative to face-to-face learning in the teaching of metadata indexing and digitization skills. This study will also ascertain if the proposed tutorial provided an effective learning experience and inform whether the constructivist design of the tutorial assisted the learning experience in terms of making learning a collaborative and shared experience.

It must be noted that academic research in online learning is still relatively new, and this is particularly so within the library and archival field. It is hoped that this study will make a further contribution to such learning both generally and more specifically.

A clarification of some of the terminology used in the research is now given.

1.9 Definition of terms

The terms "digital library" and "virtual library" have been used interchangeably at times in this research to refer to library collections hosted on the Internet. Both these terms have been used extensively by academics conducting research into digital library collections. Saunders (1999) noted some confusion relating to the use of the two terms. According to Saunders the common use of the term "virtual library" usually implies a library that provides access to a collection of distributed information in electronic format through pointers provided locally. As noted above, while the terms have been used interchangeably in this study, the author's preference is for the term "digital library".

To design the DISA online tutorial a theoretical approach to the design had to be chosen which would have to support the need for interaction and collaboration in an online learning environment.

1.10 Theories of learning

In order to understand the learning experience there is a need to recognize the theories and perspectives that outline how learning occurs.

> A theoretical foundation for teaching and learning will reflect fundamental values and beliefs about an educational experience. It is by making explicit theoretical elements of an educational experience that we reveal ideals, which we imperfectly strive for (Garrison, 2003: 11).

Educational theories are the beliefs and values that are associated with an educational experience. Educational theories changed throughout the centuries as society changed. Thus many educational theories have developed. Three theories of education have been prominent namely the behavioral, cognitive and constructivist theories of education.

Behaviorist theories

Behavioral theories of education are based primarily on the stimulus-response process. Behaviorists support a belief that observed behavior indicates whether a learner has learned something. "In contrast to biological and psychoanalytical theories that stress innate factors, behavioral theories while acknowledging developmental capabilities postulate that development can be explained by the same principles that explain other behaviors" (Schunk, 2000).

Cognitive theories

Cognitive theories of education focus on the internal processes that condition human behavior.

> Cognitive theories stress the mental organization of knowledge and the development of propositional networks of information and production systems. Cognitive principles explain how learners receive, process, store and retrieve information in memory (Schunk, 2000).

Constructivist learning theory

Constructivist learning theory holds a view that learning cannot be defined by a single theory. Constructivists believe learning occurs through a number of processes.

> The constructivist learning paradigm emphasizes that there is no single or objective reality "out there", which the instructor must transmit to the learner. Rather, reality is constructed by the learner during the course of the learning process (Almala, 2006).

Traditionally learning had been a hierarchical top-down experience with the teacher as the dominant medium of knowledge. New theories of learning that have developed in the modern era require more resources to conduct learning.

> The existing view of the learning process emerged out of the factory model of education at the turn of the 20th century and was highly effective in preparing large numbers of individuals with skills needed for low-skilled positions in industry and agriculture. It is largely a 'broadcast' model of learning where the teacher serves as the repository and transmitter of knowledge to the students (Singh, 2006: 272).

Constructivist teaching principles propose views that emphasize that learning is not a one-dimensional process. Constructivists support a new paradigm of teaching and learning based on research in human learning that promotes the following views of the human learning process.

> The hierarchical model of knowledge transfer - the instructor-led classroom setting in which teacher and learner must be present at the same time - is inconsistent with the information age objectives of employee empowerment, individual accountability and self-directed learning (Tronsden, 1998:174).

Constructivists support the idea that learning involves the interaction of a number of factors and is not an isolated event. Learning in a traditional context involved absorbing knowledge and then imparting the knowledge when needed.

A renowned proponent of constructivist learning theory was Igor Vygotsky the Russian educationist. The major focus of Vygotsky's constructivist theories on learning was that interaction plays a fundamental role in the development of cognition. "Vygotsky considered the social environment critical for learning and thought integration of social factors with personal factors produced learning" (Schunk, 2000: 243).

1.11 Theories of online learning

Online learning has grown rapidly in the twentieth century. The growth of the Internet and online learning has provoked a large volume of research.

> Online learning, today, is a topic of considerable research and empirical studies to understand the ways in which it differs from the traditional models of learning, the implications of such differences, and the ways to use the newly available technological infrastructures effectively (Blewett and Singh, 2003).

Learning using the World Wide Web and the Internet can be described as web-based

learning. The Internet is recognized world-wide as a teaching instrument. It also provides a stimulating teaching environment. Sadik (2004) states that "the Internet and World Wide Web have given new impetus to educators and computer-aided instruction designers who attempt to design and develop interactive, intelligent and human-based courseware to move toward the Internet".

1.12 Online library education
Previously education of librarians and archivists had been conducted primarily in face-to-face situations. Online learning is gaining prominence as a teaching methodology used by the library and archival professions. Developments in online learning and the development in the information technology sector now play a role in the education of librarians.

> At the same time, training and continuing education in all professions in the information sector are quite obviously also changing in the direction of ICT knowledge. Against this background, it is indeed meaningful for information specialists to make more intensive use of distance learning and e-learning than other occupational groups (Ball, 2003).

Online training has to be embraced by the library and archival training institutions in order to benefit from the opportunities offered in online learning.

1.13 The limitations of the study
The tutorial's mandate was to test whether digitization and metadata indexing skills can be taught successfully in an online environment whilst using constructivist teaching principles. The study does not focus on teaching digitization and metadata indexing in traditional face to face learning experiences.

The concept of teaching using Internet technologies has been given a number of descriptions and many definitions. There exists a difficulty in providing a single universally recognized term to describe the concept of teaching using the Internet. Therefore this research used the terms web-based learning, electronic learning, and other terms to describe the concept of teaching using Internet technologies.

1.14 Outline of the remainder of the study

Chapter 2
Literature review
This will be a more elaborate investigation of issues that were introduced in chapter 1.

- The concept of web-based learning;
- Developing a web-based learning tutorial within a constructivist learning paradigm;
- Training the digital librarian;
- Metadata indexing and digitization;
- The DISA training currently available; and

- Previous online training in digitization and metadata indexing.

The literature review will research the development of the Internet and online learning. The use of constructivist teaching principles as a method to conduct online learning will then be investigated. This will be followed with a look at the development in training for digital librarians and archivists thus far. The review will then discuss metadata indexing and digitization the two skills that are taught on the tutorial. The DISA training in digitization and metadata indexing offered by the DISA Project and the management of the functions of the DISA Project will then be discussed. The review will look at previous online training in digitization and metadata indexing and assess other online tutorials that have been developed to teach digitization and metadata indexing skills globally.

Chapter 3
Research methodology
The methodology consists of three phases and each of these phases will be described. This chapter will outline
- Phase One - Development of the tutorial;
- Phase Two - Implementation of the tutorial; and
- Phase Three - Evaluation of the tutorial.

Chapter 4
Data analysis and presentation of results
In this chapter the data will be analyzed and some of the data will be tabulated. The quantitative data analysis will be conducted using SPSS software. The quantitative data analysis will provide statistical data which will be counted and displayed in tabular format. The quantitative and qualitative data will be compared and checked for inconsistencies or anomalies and to allow for triangularization of the data.

Chapter 5
Discussion of results
The results of the research will be discussed. The research questions will provide a basis for the discussion.

Chapter 6
Conclusion and recommendations
Recommendations based on the findings of the results will be made. In this final chapter, a summary of the research will be given, conclusions will be made and recommendations put forward. Suggestions for further research will also be made.

<div align="center">**Chapter Two – Literature review**</div>

This chapter comprises the literature review and will investigate the following issues that relate to the research problem.

- Learning in web-based environments;
- Using a constructivist teaching paradigm to conduct the web-based learning;
- Training digital librarians;
- Metadata indexing and digitization;
- The DISA collection;
- The DISA training currently available; and
- Previous online training in digitization and metadata indexing.

2.1 Learning in web-based environments
Learning using the Web and the Internet can be described as web-based learning. Terminology used differs though. As Ally (2004) observes:

> Different terminologies have been used for online learning, a fact that makes it difficult to develop a generic definition. Terms that are commonly used include e-learning, Internet learning, distributed learning, networked learning, tele-learning, virtual learning, computer-assisted learning, web-based learning, and distance learning.

Providing a single term to describe learning using the Internet is a complex task. This often creates confusion amongst academics, students and other interest groups. Education using web-based resources generally refers to learning using information and communication technologies. Horton (2003: 2) refers to "training" and describes web-based training as "any purposeful, considered application of web technologies to the task of educating a fellow human being".

The Internet and the World Wide Web have influenced education in the modern era. The Internet is recognized throughout the world as a popular teaching instrument that is available to a large number of persons and institutions worldwide. The Internet facilitates and promotes both formal and informal education in an online setting. Sadik (2004) supports this assertion:

> In the last few years, the Internet and World Wide Web have given new impetus to educators and computer-aided instruction designers who attempt to design and develop interactive, intelligent and human-based courseware to move toward the Internet.

Web-based learning provides opportunities to develop new methods to educate and offers more control over the way persons learn in a modern educational context. "Well-designed e-learning courses are learner-centered, affording learners more control to regulate their own learning and to sequence it" (Herselman and Hay, 2005).

The Internet is recognized world-wide as a teaching instrument that provides stimulating learning environments. Web-based learning is conducted using an array of electronic teaching technologies. New web-based teaching technologies are developed daily. These teaching technologies are able to create formal and informal learning environments and can support students in a variety of educational environments.

> In terms of teaching and learning in distance education, where the learner and lecturer are separated in time and space, ICT in the form of a web-based learning environment can support an array of instructional delivery media, utilizing the effective pedagogical approaches that involve and seek the active participation of students in the construction of knowledge (Atan, Rahman and Rozhan, 2004).

Web-based learning has grown in the higher education sector over the last decade. Higher education learning institutions now use the Internet to store educational resources and to conduct teaching programs. However, higher education institutions should be aware that web-based education does not guarantee a successful learning experience. It is indicated by Reeves (1996: 3) that:

> There are still misunderstandings among higher education personnel about the potential of the WWW to support learning. As with previous innovations such as interactive multimedia, many faculties assume that the WWW is a "magic box," and that simply putting a course on the Web guarantees better learning.

Herselmann (2005) argues that web-based education can contribute to developing quality students for the higher education sector. Therefore a number of higher education institutions have seen the benefits of using web-based education within their teaching programs. The author goes on to say that:

> During the last couple of years we have not only seen a proliferation of private higher education institutions but also businesses and companies that have started to create their own "schools" and do the training and retraining of their personnel themselves. This increasing competition in the higher education landscape is forcing institutions increasingly to re-imagine the use of technology in the delivery of education and training particularly as more adults re-enter the field (Herselmann, 2005).

Some research indicates that some students are more suitable participants in web-based learning because they possess certain characteristics. Horton (2003: 18) identifies some characteristics that constitute the ideal web-based learner:

- Learns independently and views learning positively;
- Is self disciplined, manages time well and enjoys working alone;
- Express him or herself clearly in writing; and
- Has good technology skills and values the role of technology in business and learning.

There is also a belief that students who participate in web-based learning develop better communication, learning, and thinking skills. Ehrmann (2000) states that:

> Major improvements in educational results are far more likely when the Web is used in ways that enable significant change in who can learn, what they learn (educational goals), and or what they do when learning.

There are also many benefits to using web-based tutorials. However, they should be designed with full awareness of the realities and needs of students in a new education era, and to maintain usability of a tutorial. It is therefore important to create a good balance when designing the tutorial. An example of a lack of balance would be including too much text in a tutorial which would not attract the attention of learners and would have the opposite effect.

> To accommodate a broad range of learning styles, online Web and course designers need to move beyond text-based interactions and include visual or kinesthetic modalities, as well as intuition and thinking exercises (Mestre, Lori and Woodward, 2006).

Web-based tutorials also have to convey a message and achieve the purpose for which they were intended. A web-based tutorial should not hinder learning because of the complexity of the design of the tutorial Ellison (2005) found that:

> Some of the best distance learning instruction delivered has used the least complex technology. Based on my experience, the best instruction has quality interaction between students and the professors regardless of the delivery system selected.

Web-based learning often caters to a diverse group of learners. Therefore, a web-based tutorial has to communicate knowledge whilst making allowances for cultural differences. A web-based tutorial has to also take account of social, cultural and political issues that affect students participating in the tutorial. As Mestre (2006) warns:

> Not all students from any particular group learn in the same way. In fact, different measurement methods assess different dimensions of learning styles that address such factors as instructional practices, information processing, social-interaction tendencies, and the influence of personality. Librarians need to be aware of cultural differences that influence learning.

Selection of tools for web-based learning is also important. The usefulness of a tool and the ease with which it can be used often increases usage of a tutorial. Seymour (2005) discovered that:

> a different set of factors affected student intentions to use the bulletin board and the quiz tool respectively, which demonstrates the importance of individual learning tool consideration.

2.2 Using a constructivist teaching paradigm to conduct the web-based learning

A constructivist teaching philosophy was chosen to underpin the DISA online tutorial. Constructivist teaching philosophy emphasizes that learning occurs through a combination of events and not merely through the transfer of information and skills from an expert source to the learner.

> The theory of constructivism rests on the notion that there is an innate human drive to make sense of the world. Instead of absorbing or passively receiving objective knowledge that is 'out there' learners actively construct knowledge by integrating new information and experiences into what they have previously come to understand, revising and reinterpreting old knowledge in order to reconcile it with the new (Billett cited in Kerka, 1997).

Web-based learning contains elements that make it compatible with a constructivist teaching approach. This is because Internet technologies offer the teacher and learners access to different communication mediums, knowledge resources and storage devices that assist in designing teaching environments that promote constructivist learning. As Liaw (2002) observes:

> Web-based training is a powerful environment, one that can reshape the format of conventional instruction, such as textbooks and lectures. Indeed, Web-based training offers flexibility and cost efficiency of online end-user training and individual attention for supporting learner-controlled training.

The needs of students have to be supported in a constructivist web-based environment. In particular students' prior knowledge and experiences have to be catered for when designing a web-based tutorial. This makes it is easier to provide proper conditions for learning. Chien Sing (1999) argues that:

> activities or projects that simulate the real world in terms of depth and complexity are desirable to enhance the quality of learning experience and subsequently enhance the development of a wider range of abilities. Once learning is engaging, they will be absorbed in their environment and be more attentive, imaginative and motivated to explore further.

Merely providing students access to the Internet does not guarantee a constructivist learning experience. Lecturers should provide guidance, or assist students to create their own educational experience. Education research stresses the value of interaction in the educational process. Interaction is also an important feature of any constructivist teaching environment. Liaw (2002) indicates that "web-systems support interactive communication. In general, Web users have full control over their own learning situations, and this high level of interaction gives users dynamic control of information".

Modern learning environments now enable learners to use information resources and technologies to create authentic learning experiences. Many educational environments now support the development of more effective authentic learning environments.

Herrington and Reeves (2006) indicate that "In recent years there have been a number of attempts to formalize particular designs for learning; learning designs that can guide and inform teachers as they seek to create effective learning environments for their students." The authors go on to say that:

> In authentic learning settings for example real life authentic tasks are used to create the core of the learning environment, and the completion of tasks effectively occupies the entire student commitment for the course (Herrington and Reeves, 2006: 235).

A constructivist learning environment recognizes unique interests, styles and capabilities of individual learners. The constructivist learning environment should empower students by allowing them control over their educational environment. Students should also be encouraged to understand the significance and rationale of constructivist principles of the tutorial. Students who understand constructivist learning philosophies are more likely to be committed participants in the tutorial.

When students understand the value of a shared learning experience in a learning environment there will be a positive response to learning. Once learning is engaging students become more active participants in an online tutorial. Providing a stimulating collaborative learning environment is not a guarantee for a successful learning experience. Learners also have to be disciplined in their patterns of learning. Chien Sing (1999) believes that:

> Empowering students however needs to be complemented by effective self regulation. Students must be able to plan and set their own goals, reflect and assess their progress as well as determine how to proceed.

Learning in the new technological educational environment is not a passive process. Internet technologies now enable contact and communication between lecturers and students. Traditional teaching methodology catered to students that were passive in the learning process. A constructivist learning approach encourages students to engage with the learning environment and master the technologies found therein to enable an optimum learning experience.

> New pedagogical methods based on these theories are turning away from passive methods of teaching that require no action on the part of the student beyond listening and taking notes, to interactive delivery methods that enable the student to control and manipulate the instructional environment (Bodomo, 2005).

A constructivist teaching philosophy supports communication in the learning process. It encourages communication between many resources and minds in order for learning to be achieved. A number of web-based learning tools assist and encourage communication and interaction amongst students and tutors. Discussion forums and chat rooms are two popular communication tools available on the Internet that allow the tutor to participate in and evaluate learning. Keats (2007) states that:

Discussion forums also allow the educator to assess the learners understanding of key concepts and provide appropriate feedback. Discussion forum contributions can also contribute to continuous assessment.

Discussion forums provide educators with opportunities to assess whether learners understand key concepts. Participation in discussion forums and chat rooms can be used to indicate whether collaboration in learning is being achieved.

This does not allow learners to passively consume a lecture without critical reflection, learned knowledge and skills are needed to perform the task which stimulates the students to think about the arising problems and techniques (Nejdl, 1997).

Collaboration is an aspect of constructivist learning that enables learners to support each other. To ensure collaboration and participation in learning, learners must receive stimulation and motivation to learn. The learners must also receive support from fellow learners and teachers. Collaboration will also ensure that each learner makes a contribution to the learning process. Harasim (1989) states:

As each person's idea is contributory to achieving their common goal, collaboration gives value to their voice and helps them to form their own stand. With an actual audience, there is someone who really listens and considers their ideas. Therefore, they begin to realize the importance of their own ideas and the significance of presenting this voice clearly.

A feature of collaborative learning is the support learners offer to each other or they get from tutors. Support learners receive in their interaction with tutors or a mentor in an online learning environment is referred to as scaffolding. Scaffolding is support provided to help learners develop new skills, concepts and levels of understanding. Scaffolding for effective student centered learning can be provided by:

- providing peer support in the task that the learner is attempting;
- enabling learners to search for and share information and later perform these functions independently; and
- enabling learners to articulate problems, share solutions and engage on collaborative problem solving (Oliver and McLoughlin, 2001).

Learning activities that support scaffolding are mainly collaborative and co-operative activities that involve discussion and dialogue between tutors and learners.

2.3 Training the digital librarian

The training of librarians in the current era has to take into consideration the new technological environment. Hoskins (2005) states that librarians need to be equipped for the challenges of new computer technologies:

The widespread use of ICT in libraries and especially the development and access to digital information resources via the Internet, has raised a number of challenges and concerns for librarians.These include the impact of ICT on the role of librarians and

the resulting need for new skills and competencies suitable for the digital information environment (Hoskins, 2005).

The development of the Internet and digital libraries has created a demand for librarians with technological skills.

To be a digital librarian a wide range of computer skills are required. The constant growth of Internet technologies places a demand on librarians to constantly learn new techniques to use the Internet and other technologies to do their jobs as digital librarians.

> A digital librarian, a type of specialist information professional who manages and organizes the digital library, combines the functionality for information, elicitation, planning, data mining, knowledge mining, digital reference services, electronic information services, representation of information, extraction, and distribution of information, co-ordination, searching notably CD-ROMs, online, Internet-based WWW, multimedia access and retrieval (Sreenivasulu, 2000:12).

Training programs are now developed for librarians to work in computerized libraries. These training programs have focused on developing computer skills needed to use library electronic databases, computer catalogues, web-based information resources and web pages. Sreenivasulu (2000:17) points out that:

> For more than 25 years, schools of information studies have been adapting their curricula and teaching activities to the new information technologies (IT). All of those changes have occurred within the broad umbrella of information studies.

There is now also a need to develop training programs to teach skills needed for the organization and categorization of library web-based resources. This can only be done if we understand the specific digitization and metadata indexing skills that digital librarians and archivists should possess.

> An important step in dealing with these needs is to design educational programs appropriate for preparing future digital librarians for the workplace. To design such programs, we need to understand the staffing patterns in digital library practice, the activities and tasks in which current practitioners in digital library development are involved, and the practical skills that help these practitioners function effectively (Choi and Rasmussen, 2006).

The growth of web-based learning has also contributed to the education of digital librarians and archivists. Web-based teaching tools have provided new tools to educate the digital librarian.

> Web-based training is a powerful environment, one that can reshape the format of conventional instruction, such as textbooks and lectures. Indeed, Web-based training offers flexibility and cost efficiency of online end-user training and individual attention for supporting learner-controlled training (Liaw, 2002).

The digital librarian is also responsible for managing the digital library. Management of digital libraries requires staff with computer, library and management capabilities to ensure sustainability of digital libraries. Digital librarians should have an all round knowledge of various library functions in order to work within the modern digital library environment.

> Digital libraries are the future of academic and research institutions, and digital professionals will be required to have more breadth and depth of knowledge and skills across the dimensions of traditional library knowledge, technology, and human relations (Choi and Rasmussen, 2006).

2.4 Developing a web-based tutorial to teach meta-data indexing and digitisation skills to the library and archival profession

Internet and web technologies are already being used to conduct library and archival science training programs. More library and archival digital collections are now found on the Internet. Chowdhury (1999) states that this has created a demand for library and archival staff with specialist computer skills.

> Today's information professionals need to learn more about computerised information retrieval, but at the same time they need to learn the theory, tools and techniques behind the traditional approaches to organizing and processing information, much of which will be applicable in the storage and retrieval of electronic information in digital libraries.

Digitisation and metadata indexing are two disciplines that need to be taught. They require students to grasp the technical aspects of the two subjects. Teaching these subjects in an online environment is a greater challenge than teaching traditional library subjects which are generally theory based. A tutorial that teaches digitization and metadata indexing requires the transfer of technical skills in the learning process.

Teaching digitisation and metadata indexing skills to library and archival staff is a necessity due to developments of the Internet and networking technologies. Developing an online tutorial to teach digitization and metadata indexing skills to the library and archival profession fulfils an important need for the library and archival profession. Each of these skills will be discussed in turn.

2.5 Metadata indexing

There have been many attempts to describe metadata. A simple explanation is offered by Intner, Lazinger and Weihs (2006):

> Metadata is data about data, this can be found at least as the opening salvo, in nearly all articles on the subject, although this routine definition by itself doesn't take us very far in understanding what metadata is and why we need it.

Metadata indexing describes the indexing of digital content on the Internet.Traditional library cataloguing and classification systems are unable to adequately classify and

catalogue web-based resources. Unique indexing systems have been developed to store, retrieve and search digital formats in an organized structured manner. Libraries and archives and other professions are required to find methods to manage their web-based information resources.

> With the magic growth of web resources, librarians and information specialists recognize the need to create methods for description, organization, and retrieval of these objects. They are not alone in this effort, because creators, providers and users of electronic resources in the academic, public and commercial sectors also realized the importance of managing and organizing the growing number of web resources (Vellucci, 1998).

A large amount of research has been dedicated to develop systems to index the digital records found on the Internet. Metadata indexing has grown due to the growth in the number of digital records that are now found on the Internet. There are many types of records in different digital formats that require classification using metadata indexing. Bibliographic records that can receive metadata indexing include websites, electronic books, electronic journals, PDF documents, text documents, image files and video files.

Metadata indexing preserves access to the intellectual content of digital collections. Lazinger (2001:78) emphasizes the value of this:

> It is access to the intellectual content (or visual content, if the digital object is an image or collection of images) we are preserving rather than the physical object or medium. To preserve access to the intellectual content, we must preserve the integrity of the intellectual content, even as we discard the original storage medium, software and hardware on which the digital object was created and accessed.

A number of institutions that conduct digitization projects throughout the world have developed their own metadata indexing systems. Appropriate metadata has to be created for digital objects. Metadata indexing is implemented to perform functions that are similar to cataloging and classification. Gartner (2008) shows why metadata is an essential for the development of digital libraries:

> Metadata is the core of any information retrieval system and so its implications for any digital library are profound: the choice of a metadata scheme underpins any such library's ability to deliver objects in a meaningful way, and greatly affects its long-term ability to maintain and preserve its digital assets.

Metadata should be created at the start of a digitization project and not after the digital object has been created. Creating metadata after a digital object has been created is a complicated and time consuming process. Metadata provides information regarding the creator, structure and format of a digital object.

Metadata can be broken down into three types:.
- Descriptive metadata;
- Administrative/technical metadata; and
- Structural metadata (Hughes, 2004:196).

Descriptive metadata
This provides descriptive information for an electronic resource. It enables intellectual and physical access to electronic resources. Descriptive metadata is used to index, discover and identify a digital resource. It provides information about the physical attributes of the resource, for example, dimensions and condition. It also provides bibliographic attributes, for example, the title, author, and keywords.

Administrative metadata
Administrative metadata provides information that enables the management of the digital resources.

This is information that allows a repository to manage its digital collection e.g. date of scan, resolution, rights information. The appropriate technical and administrative metadata, (such as catalogue details, copyright status, capture information, file format, resolution etc.) will assist the project manager in maintaining and preserving digital content (Hughes, 2004: 198).

Structural metadata
Structural metadata provides information on the structural divisions of a resource so that it can be rendered to a user in a sensible form. Structural metadata enables the presentation and use of a digital object.

According to Hughes (2004) "This is metadata relevant to the presentation of a digital object to users and to the relationships of digital objects to one another and to external resources".

In the discussions on metadata a number of misconceptions about metadata prevail. Nilsson, Palmer and Naeve (2002) highlight some misconceptions regarding metadata:

- Metadata is objective data about data;
- Metadata is a resource produced only once - Updating and modifying metadata must be viewed as a natural part of the metadata creation and publishing process, an evolving kind of information that is subject to constant updates and modifications;
- Metadata must have a logically defined semantics - There is no language up to the task of capturing all the possible meanings we might want to encode on the web; and
- Metadata is the digital version of library indexing systems - Metadata besides carrying out the descriptive and subject defining functions of traditional library systems, serves additional functions, such as certifying content, tracking the history of extensions and versions, and monitoring and tracking

processes and interactions to name a few.

A number of organizations have developed their own metadata standards in order for them to access and manipulate the web resources they use. The development of metadata standards enhances the use of web resources.

The DISA project adopted two metadata standards to host journals, pamphlets and other bibliographic resources in the DISA collection. The two standards are the Dublin Core Standard and the Text Encoding Initiative.

2.5.1 The Dublin Core Standard

The Dublin Core Standard allows libraries to search and retrieve bibliographic records across bibliographic databases by converting these bibliographic records to the Dublin Core format. The Dublin core format contains a standard number of descriptor fields that are used to describe any record.

The Dublin Core has a standard set of rules that describe information that is found online. The Dublin Core Standard has two levels of use, Simple and Qualified:

- Simple Dublin Core which comprises of fifteen elements - they are title, creator, subject, description, publisher, contributor, date, type, format, identifier, source, language, relation, coverage, and rights; and

- Qualified Dublin Core which contains three additional elements, namely, audience, provenance and rights holder.

An advantageous feature of a Dublin Core record is that it is inexpensive and easy to create. Dublin Core records can also be retrieved in an organized and efficient manner. They are interoperable amongst different systems and are used by many countries that conduct digitization projects (CDP Metadata Working Group, 2006).

The Dublin Core metadata set is a cross-subject, cross-disciplinary effort to develop mechanisms for the description of diverse resources in an electronic environment. The Dublin Core is able to capture essential aspects related to the description of electronic resources. The Dublin Core format can be used to describe video, sound, image, text and composite media like web pages.

The Dublin Core Metadata Initiative (DCMI) continues to lead the international community in the development of structured metadata into the twenty-first century (Intner, Lazinger and Weihs, 2006).

2.5.2 (TEI) Text Encoding Initiative

The Text Encoding Initiative is the work of a consortium of institutions created to maintain and develop standards for the representation of texts in digital form. TEI schemes are designed to support a particular research or production environment. A number of research efforts were conducted to develop the TEI guidelines. TEI provides

guidelines and standards for developing digital collections.

> Digital librarians have benefited greatly from the standardization provided by these guidelines, and the potential for interoperability and long-term preservation of digital collections facilitated by their wide adoption (Digital Library Federation, 2006).

There are a number of electronic texts throughout the globe that need to be accessed by academic communities. The challenge was to develop a system to manage these texts. Electronic information resources are valuable to researchers and libraries need to find new and better ways to support this research. There have been many efforts made in this regard. The Digital Library Federation played a role in such an effort:

> In 1998, the Digital Library Federation (DLF) sponsored the TEI and XML in digital libraries workshop at the Library of Congress to discuss the use of the *TEI Guidelines* in libraries for electronic text, and to create a set of best practices for librarians implementing them (Digital Library Federation, 2006).

The development of the Extensible Markup Language (XML) format makes it easier to store, share and search information resources in different formats. XML also enables data to be shared and combined in ways that would not otherwise be possible (Bannerjee, 2008).

The TEI is used to encode metadata for books and periodicals. Each TEI document has to conform to the requirements of the TEI standard.

A feature of the TEI is that it provides tags to mark up material from a large number of subjects in the arts and humanities. "The TEI markup structure provides markup tags for almost all materials of interest in the humanities, including prose, verse, drama, dictionaries, linguistic transcriptions, and other texts" (Nellhaus, 2001).

The TEI system also enables the bibliographic holdings of a number of information repositories to be displayed on the Internet.

> [TEI] Guidelines are an international and interdisciplinary standard that enables libraries, museums, publishers, and individual scholars to represent a variety of literary and linguistic texts for online research, teaching, and preservation (The Text Encoding Initiative, 2006).

Some well-known projects that have used the TEI include the Canterbury Tales Project, Medieval Nordic Text Archive, Oxford Text Archive and the New Zealand Electronic Text Centre.

2.6 Digitization

The digitization of library and archival records is necessary due to the growth in the number of library and archival records in digital format found on the Internet. Digitization is the process of converting analogue content into digital representations.

Digitization converts analogue content to binary code that is readable by computer.

The UNESCO Digitization Guidelines (UNESCO, 2002) underlines some of the purposes of digitization:

> Digitization enables the preservation and accessibility of library and archival information resources. Digitization meets the demand for electronic versions of text and images that need to be hosted on the Internet. Digital technologies offer a new preservation paradigm. They offer the opportunity of preserving the original by providing access to the digital surrogate of separating the informational content from the degradation of the physical medium.

Digitization enables the preservation of information resources and makes these resources easily accessible by anyone on the Internet. Digitization provides a number of options to store, manage distribute and disseminate digitized records. As Wentzel (2007:7) points out:

> By digitizing an original and placing a digital copy of it on a computer, the file can be manipulated, transferred, and stored with ease. Storage and distribution are the primary factors behind the national push for digitization. Storing a numeric or digital representation of photographs on a CD takes up far less physical space than the boxes and photo albums stored on shelves.

The digital conversion process in most cases is conducted through scanning. Scanning is the most popular form of digitization used by libraries and archival institutions. Scanning is a specific skill which has to be developed through training.

> Making good scans means doing more than just pressing buttons. If you understand what software to choose, which file formats to use, and what the specifications really mean, you can create digital images with optimal quality (Wentzel, 2007:.7).

The most popular scanners are the flatbed scanner, the slide scanner, the drum scanner, wide format scanners and digital cameras. The type of scanner chosen still requires the person doing the scanning to be trained to produce quality scans.

> While the flatbed scanner does the actual digitization, the device has no understanding of what operators want for output nor does it store the files or perform alterations. Similarly, software like Adobe Photoshop and Microsoft Word do not operate the scanner; they are used to create and edit image files or documents (Wentzel, 2007).

A significant financial investment is needed to purchase the hardware and software to conduct the digitization process. There are a number of brands of scanners in the market and a number of suppliers of scanners. A digititization project should choose the scanner that suits the specific needs of their own project.

What scanner is right for your project depends on numerous factors including overall project goals, format, size, and condition of materials to be scanned and available budget. Several technical factors will also influence your purchase including available optical resolution, bit depth, size of scan area, speed, connectivity, and ability to handle different formats and materials in your collection (Western States Digital Standards Group Digital Imaging Working Group, 2003: 12).

Digitization is an expensive process, due to the high cost of the equipment and the software required for this process.The digitization process involves a range of procedures and technologies that have their own cost implications.

A common question asked regarding digitization is the reason why digitization projects are initiated. Digitization projects are conducted for a number of reasons, and some of the more common reasons are:

- to preserve bibliographic material that faces the prospect of deterioration due to age or harsh environmental conditions.

- to provide information to users beyond the library walls as Coyle (2006) notes:

  Today's information seekers are less likely to actually enter the library than in the past. The library must now deliver materials to the user, both in a convenient format and as close to instantaneously as possible. Digital files are ideal delivery formats because they can be placed online for user access or faxed or e-mailed.

- to enable access to bibliographic collections, allowing a collection to be accessed by persons previously excluded from access due to economic, social or political constraints. In this regard Hughes (2004: 9) points out that:

  Digital materials can be made available to a broader audience than those who have the resources or ability to travel to see the analogue collections, and access can be expanded to non-traditional audiences such as life-long learners. Audiences can access the collections for often unanticipated and broad ranging research interests.

- to assist in the conservation and preservation of heritage. According to Moss and Curral (2004:128): What most sets the digitized object apart from its analogue counterpart is the ease and flexibility with which it can be made available to a wide and diverse audience without incurring distribution costs that rise in line with demand and also do not result in wear and tear of the surrogates delivered to the user. This provides a huge potential for digital resources to be used as a 'shop window' to promote and market physical assets held on-site in heritage collections.

- to preserve published literature of a particular socio-political time period.

A number of prevailing world standards exist that can be used by a digitization project to name and describe digital content

> Before a name and a description of an image file is considered it has to be decided how it should be stored. Normally, the source documents being scanned are physically organized according to principles of archival or library arrangement. Holdings of documents are often divided into series, volumes and issues, and collections of manuscripts and photographic items have numbers (UNESCO, 2002).

The UNESCO Standards for digitization are guidelines that should be used to conduct digitization and guarantee the quality of a digization project. The UNESCO guidelines (2002) recommends that digitization projects should be:

- User driven, on a high demand for enhanced access to content;
- Opportunity driven, when money is available for a particular initiative;
- Preservation driven, when there is a need to protect fragile materials from handling; and
- Revenue driven, where there is an opportunity to generate income from digital resources.

Institutions that conduct digitization projects want to promote the goals of the institution and enable the publications of the institution to become more visible to research communities of the world. These institutions need to be vigilant in their application of guidelines and standards to manage digitization projects.

> Institutional priorities and standards should always be at the forefront of digitization priorities and strategies. What are the collections for which the institution is best known? Are there policy goals and objectives which inform digitization? Is it necessary for the institution to get on board "the digitization bandwagon" for political reasons? (Hughes, 2004: 47).

The reasons for implementing a digitization project or for digital conversion of non-digital source material are varied and may overlap. The DISA Project listed the following as reasons for implementing their digitization project:

- To increase access: this is the most obvious and primary reason, where there is thought to be a high demand from users the library or archive has the desire to improve access to a specific collection.
- To reduce the handling and use of fragile or heavily used original material, and to create a 'back-up' copy for endangered material.
- To give the institution opportunities for the development of its technical infrastructure and staff skill capacity (DISA, 2006).

The quality and quantity of the content to be digitized and the specific needs of an organization also influence the costs for that particular digitization project.

> If materials need to be converted to digital form, either onsite or through a vendor, then the type of material, the degree of digitization, and resolution of the digitization will affect the cost, as well as the general condition of the material being digitized, with fragile material adding to the cost (Lazinger, 2001: 111).

Digitization requires the use of sophisticated computer technologies. This includes scanners, computer hardware, computer software and digital imaging software.

> The use of technology has become a core part of the institutional mission of museums archives and libraries around the world. Computer-based systems are now considered essential for many operational aspects of such memory institutions. These include collections management, as in the use of administrative databases and online catalogues (Hughes, 2004: 5).

There is also a need for selection policies for digitization projects. It is not possible to select every record for digitization as explained by Moss (2004):

> Contrary to the belief of some, it will never be possible to 'digitise the world' or entire holdings and as a result material will need to be carefully and judiciously selected just as in the analogue world.

Selection policies needs to be put in place before a digitization project is started. Selection policies should be guided by criteria related to the value and significance of a resource to the overall collections. Various factors will influence what items are selected for digitization.

Factors to consider would be:

- The suitability of the material to the collections focus; and
- The intellectual value of the content:

> Regardless of the purpose for implementing a digitization project, the selection of source material will always be more or less content driven. In fact, intellectual value is the basic question in all kind of selection: does the content (the value to the potential reader) of this material justify all the efforts, costs and other resources that will be needed? (UNESCO, 2002); and

- The mandate of the institution; and
- The value of the materials in comparison to other material in the entire collection.

The digitization process has to deal with a number of challenges which include:

- The shape, size and condition of the original source material often determines how good a digitized product will be;
- A wide range of digital formats are now available; and
- Digital collections at most times are not homogenous. This requires investment in more technologies to digitize documents into different formats (UNESCO, 2002).

Skilled staff members are required to conduct the digitization process. Often library and archival organizations do not have personnel with the necessary skills to conduct a digitization exercise. The reason for this in many instances is that digitization skills are new skills that were not considered as essential until recently. The UNESCO guidelines (2002) outline some of the essential digitization skills that staff should possess:

- Image capture: to capture a digital image from a physical object;
- OCR (Optical Character Recognition) to convert imaged text into machine-readable format;
- Mark-up languages: standard protocols for adding metadata, e.g. HTML, XML;
- Metadata standard schema of administrative, descriptive, structural and preservation information, e.g. Dublin Core; and
- Indexing and database technologies to search and retrieve digital resources.

2.7 The DISA collection

The content hosted on the DISA website adheres to guidelines which are based on international standards of digitization. The UNESCO document "Guidelines for Digitization Projects" outlines the basic requirements to host a digitization project:

> The real challenge is to design a website that has reliable and up to date content and a user interface that is easy and intuitive to accommodate the needs of different users, both scholarly and the general public. Some basic technical guidelines exist to ensure a consistent, high standard is maintained in the production and management of a website (UNESCO, 2002).

The initial work of the DISA Project started with co-operative efforts between the DISA Project and South African library and archival institutions which owned historical documents that were identified for the DISA Project website. The DISA Project obtained resources and established procedures for these institutions to supply images to the DISA Project.

> The DISA Project has acquired necessary funding to supply scanners to institutions who choose to scan documents at their own institutions and email these scanned images to DISA. The scanned images then go through a process of quality control by DISA staff before being loaded onto the DISA website (DISA, 2007).

The DISA Project has developed processes to implement quality control when conducting the entire scanning process and to meet DISA's specific requirements. DISA have developed their own set of guidelines which outlines specification for scanned documents that will be hosted on the website. An example of this is the guidelines for scanning:

> Front covers are scanned at 600dpi RGB colour (24bit) at 50% of pixel width. Individual pages are scanned at 600 dpi grayscale (8bit) at 50% of pixel width Photographs on book and journal pages 200dpi grayscale (8bit) with pixel width reduced to 500 pixels (DISA, 2007).

There are a number of open source software options available to conduct scanning. GIMP is an open source Image Manipulation Program which is a freely distributed software for tasks such as photo retouching, image composition and image authoring. It can be used on many operating systems, in many languages. However, Adobe Photoshop software is the commercial imaging software used by the DISA Project for scanning and editing of scanned images. These scans are then uploaded onto the DISA website.

The DISA Project has developed guidelines for image capture of books, journals, archival material and photographs. The development of a set of standards for a digitization project is an indication of the credibility of that project. The Digital Library Federation (2002) outlines the benefit of establishing standards and guidelines for the management digitization projects:

> Standards and guidelines associated with library digitization practices vary from project to project. Over the years, university, public, school, and special libraries have adopted their own policies with regard to digitization. Some older standards, as well as more recent ones, are widely accepted and practiced by library digitization projects. Metadata standards and image quality standards and guidelines are commonly sought when planning digitization projects.

The DISA Project has guidelines that provide naming conventions and standards for content that is hosted on the DISA website. These guidelines regulate the type of content that is hosted. "In order to standardize best practice on the DISA project, a numbering system, designating participating institutions and collections, is maintained and applied in the file naming convention" (DISA, 2004).

The DISA guidelines can be downloaded from the DISA website. The guidelines set best practices for digitization work with images, text, journals, files and folders. Scanned images and text documents are named according to DISA file naming conventions. The DISA Project has outlined the reasons for developing these standards, namely to ensure there is:

- Increased interoperability and accessibility across institutions through the useof generally accepted international standards and formats;
- Consistency in quality; and

- Promotion of best practices thus avoiding future rescanning of material (DISA guidelines for best practice, 2007).

2.8 Online training programs in digitization and metadata indexing

Online education currently plays a significant role in the way librarians and archivists are now trained. This is evident by the continual development of digitization training in library educational programs in the last decade.

> For more than 25 years, schools of information studies have been adapting their curricula and teaching activities to the new information technologies (IT). All of those changes have occurred within the broad umbrella of information studies. The new digital information system (DIS) creates a major shift in the paradigm of the information transfer process (Sreenivasulu, 2001).

There is widespread recognition of the need for training in digitization and metadata indexing. A report published by the American Institute of Museum and Library Services (IMLS) in August 2003 indicated the growing awareness amongst library professional societies of the need for tutorials teaching digitization and metadata indexing.

> While acknowledging the many existing strengths of our current digital environment, the report also identifies four specific areas worthy of further attention and funding. These include (a) infrastructure (defining a national strategic agenda), (b) audience research and development, (c) collaboration, and (d) professional development. Of these, the most pertinent to the present discussion is the issue of professional development (Perry, 2005).

It is evident that the institutions that develop digital learning programs understand the value and importance of having digitization and metadata indexing tutorials to train library and archival workers. In her study on the education of future digitizers Maruso (2005) pointed out that:

> None of the institutions [which were surveyed] with current or future digitization plans said they "do not see a role for our institution in digitization". So one can see digitization is something institutions are doing and want to continue doing, but need help in learning the process (Maruso, 2005).

The workshop format of teaching was initially a popular method for teaching digitization. As Perry (2005) observes:

> By far the most commonly available approach to learning about issues and skills relating to digitization is the workshop format. These include intensive week-long immersion programs, half- or full-day workshops on specific topics, and online instruction.

However, the presence of online education programs that teach digitization and metadata indexing has been well established in the library and archival world. The need for more

online tutorials that teach metadata indexing and digitization continues to grow (Bawden, 2005). There are a number of notable online digitization and metadata indexing tutorials that have been developed around the globe and these include:

- **Moving Theory into Practice: Digital Imaging Tutorial"**, by Cornell University Library (Moving Theory into Practice: Digital Imaging Tutorial, Cornell University Library). http://www.library.cornell.edu/preservation/tutorial/

- **Basics and Beyond"** online digitization training program developed by the Illinois Digitization Institute Project that provides training for the unique digitization needs of the Illinois state. http://images.library.uiuc.edu/projects/IDI/

- **The Collaborative Digitization Project"** offers digitization and digital project training originally begun by the Colorado State Library originally established as the Colorado Digitization Project in 1999 (Bibliographic Centre for Research - Collaborative Digitization Project).http://www.bcr.org/cdp/

- "**IS 206** - **Information and Knowledge Management"** established by the late Dr. T.B. Rajashekar of the National Centre for Science Information, Indian Institute of Science http://www.ncsi.iisc.ernet.in/raja/is206/

- The **IMARK digitization tutorial** that has been developed by The Food and Agriculture Organization (FAO) of the United Nation. http://www.imarkgroup.org/index_en.asp?m=0

Each of the above are briefly discussed below:

Initially only a few online digitization tutorials were found on the Internet. The Cornell digitization tutorial "Moving Theory into Practice" was one of the first acclaimed digitization projects found on the Internet. According to Maruso (2005):

At the time there were few options available for people wanting digitization training, and, although those that existed were all nationally-acclaimed, they did not meet the particular needs of potential digitization projects in Illinois. Cornell University offered their Moving Theory into Practice web site as a free, self-guided tutorial. Cornell also offered a week-long Moving Theory into Practice workshop which took place on the Cornell campus.

The Cornell University online digitization tutorial acquired recognition internationally as a standard for teaching digitization in online and face to face learning environments. A number of library and archival institutions throughout the world participated in Cornell University library digitization programs including institutions and libraries in the

Netherlands (Alkhoven, 2005). This well researched quality tutorial has achieved international recognition. It is divided into 10 sections that deal with the main elements of the digitization process. It is available on the Internet for use around the globe.

The tutorial consists of sections encompassing all the major aspects of digital imaging: selection, conversion, quality control, metadata, technical infrastructure, presentation, digital preservation, and management. Designed to be self-guided and self-paced, the tutorial includes frequent "reality checks" for evaluating the understanding of the presented material. Most sections are heavily illustrated, and provide suggestions for further reading (Jones and Sandore, 2002).

Cornell University Library also conducts digital imaging programs that are linked to the "Moving Theory into Practice: Digital Imaging Tutorial" online tutorial. An example of this is the one-week workshop held at the Georgia Archives in Morrow, GA (HBCU workshop, 2005). The goal of this workshop was to increase library staff digitization skills and promote best practices in digital imaging. The workshop consisted of a number of formal and informal training activities.

> The customized workshop included a discussion of selecting material for digitization, intellectual property issues in digitization, and methods for the dissemination and sustainability of digital collections. Through lectures, group exercises, and directed lab assignments, participants develop the means to select collections for digitization and benchmark requirements for conversion and access (HBCU workshop, 2005).

The Illinois Digitization Institute developed the "Basics and Beyond" online digitization training program to provide digitization training for the Illinois State. The program was developed in order to offer digitization training that would meet the particular digitization needs of Illinois library workers which were different to training solutions offered at the current time.

> One of the primary goals of the Institute was to develop training to provide cultural heritage professionals with the means to mainstream digitization into their institutions' activities. We were interested in developing a model that differed from the nationally acclaimed workshops offered by the Cornell University Library and the Northeast Document Conservation Center (NEDCC), by providing both training opportunities and continuing advice (Jones and Sandore, 2002).

The "Basics and Beyond" digitization training program was broken up into three different training tracks:

> Track 1 provides a one-day basic digitization workshop and Tracks 2 and 3 are web-based courses. Track 2 is a three-week on-line course significantly expanding on the information provided in the Track 1 course. Track 3 combines the three week on-line course with an intensive two-day workshop held at the University of Illinois at Urbana-Champaign (UIUC) campus (Jones and Sandore, 2002).

The training programs on the "Basics and Beyond" tutorial are designed to provide participants with choices to suit their unique digitization needs. Participants needs differ because some participants have very basic information needs whilst some have already started a digitization project or completed digitization projects in the past. Also it was found that some institutions only have budgets to participate in a workshop while others have more finance and time to take on extended training (Jones and Sandore, 2002).

The Colorado Digitization Project (CDP) was developed by the residents of Colorado to provide access to the history of Colorado. The CDP trains and assists other cultural heritage institutions to build their own digital collections. The project offers best practice guidelines, access to digitization tools, digitization training and special projects. The project provides support and assistance to institutions to build their own projects. A Digital Toolbox facility is found on the Projects website. It contains a set of tools designed to be used to assist in building digitization projects. The efforts of the CDP have enabled other cultural heritage organizations to develop digital collections. Allen (2000) highlights some of the characteristics of the Project:

> The Colorado Digitization Project models a highly distributed and collaborative method of creating digital primary resource collections. The benefits of such a model include sustainability, improved capability for contributing collections and resources from all types of cultural heritage organizations, and continued collaboration on a very broad basis that extends beyond digitization.

The "IS 206 - Information and Knowledge Management" course is an online tutorial developed by the National Centre for Science Information (NCSI) in Bangalore India. The project was headed by the late Dr. T.B. Rajashekar, former Chairman of the National Centre for Science Information (NCSI), Indian Institute of Science, Bangalore.

The aim of the course is to develop skills that are required to manage the different facets of digital libraries:

> Primary objective of this course is to explore and understand various schemes for organizing information resources and develop competencies in their usage, with particular emphasis on digital information resources in a networked environment. (Rajashekar, 2005).

Dr. Rajashekar played a leading role in the construction and development of the course.

> He was largely responsible for the content and curriculum of the 18-month training program on information and knowledge management at NCSI, which is unlike any other program taught anywhere else in India. The curriculum always reflected the most recent developments (Rajashekar, 2005).

The course was designed to combine the principles, practices, standards, technologies and tools of digital libraries with the practices of traditional libraries and knowledge management to develop a new digital information service.

Dr. Rajashekar also contributed to other online training programs for the management of digital libraries. They include Digital Library and Information Services in Enterprises (IS214) and Internet and Information Resource Discovery (IS213).

The IMARK digitization tutorial has been developed by the Food and Agriculture Organization (FAO) of the United Nations. It was designed to provide learning opportunities for agricultural information and documentation workers in developing countries. IMARK consists of a series of interactive learning modules entitled Information Management Resource Kit (IMARK).

> Electronic learning, or e-learning as it is commonly referred, was selected as the best mode of delivery for IMARK, as it offered numerous possibilities to use state of-the-art technologies to create an interactive, self-paced learning environment which is highly suited for distance learning and distribution to a wide audience (Nadeau, 2008).

The IMARK tutorials are designed to cater to information workers with various levels of experience.

> Each IMARK module is being designed in such a way that learners with various levels of experience, or having specific needs, can create tailored courses by designing their own Personal Learning Path, often saving significant study time (Rose, 2005).

Certain parts of the IMARK module are dedicated to digitization and metadata indexing. They are Unit 2 - Electronic documents and formats and Unit 3 - Metadata standards and subject indexing and Unit 4 - Creation and management of digital documents. A need existed for digitization training for professional library staff and students.

> In mid 2003, Food and Agriculture Organization of the United Nations (FAO), and the Indian Institute of Science (IISc) in Bangalore decided to work together to prepare an IMARK module at a higher level, designed to introduce professional librarians and information science students to the field of "Digitization and Digital Libraries" (Rose, 2005).

This module was also used as a teaching aid for credit courses in Digital Libraries for MSc students in the Department of Information Science of the University of Madras.

The tutorials consist of many tools and other functions to enable the training of future digital librarians.

> In addition to the lessons themselves, the module provides the learners with access to an internal search function and a technical glossary, as well as with on-board and on-line reference materials, including relevant non-proprietary software applications and tools. The module also contains several resources, including Greenstone Digital Library software, three thesauri related to Agriculture and a digital imaging tutorial.

The module CD-ROM is available free of charge (Rose, 2005).

2.9 DISA Project training
The DISA Project has conducted its own training programs in digitization and metadata indexing at the DISA Project offices and at library and archival institutions in South Africa and neighboring African countries. At the outset financial resources were required to run the training courses. Peters and Pickover (2001) noted that the training offered by the DISA Project at the time required a significant financial investment and pointed out that:

> While the interest in staff development is high in South Africa, financial constraints in light of demands for basic library services in remote areas have limited the development of digital library skills to the tertiary education sector and national institutions.

One of the aims of the DISA Project was to identify digital collections in South Africa and the Sub-Saharan region and to assist staff of these institutions to digitize and index the material in their collections. The intention of the DISA Project was to provide training facilities to these institutions and to host these digital collections of these institutions on the DISA website. These objectives were in keeping with the United Nations Charter on Digitization:

> Obtaining resources from library collections throughout necessitates the provision of suitable training to personnel at various feeder institutions in order to obtain journals from various libraries across the country (UNESCO, 2002).

The face-to-face training conducted by the DISA project had significant cost implications including the provision of accommodation, facilities and transport for DISA staff and participants involved in the training. As UNESCO points out "Running a digital imaging project means balancing the needs of known and potential users, the technological infrastructure used by the project, and the demands on available human and financial resources" (UNESCO, 2002).

As an alternative to face-to-face training programs an online learning environment to conduct training was considered. Apart from substantial cost savings it was envisaged that an online tutorial would allow the learners and tutor to interact over great distances over a longer period of time in contrast to the face-to-face training. A web-based training model would also allow learners to interact with each other through the use of chat rooms, open forums and email postings. As noted, an online learning environement also had the potential to be more cost effective when compared to face-to-face training.

It was anticipated by the researcher that some of the issues that could be associated with conducting digitization and metadata indexing training in a web-based learning environment would include:

- The online training program would require technical support from the DISA Project and staff at ITED and UKZN.
- The subject content of metadata indexing and digitization is of a technical nature. Teaching these technical skills in an online learning environment is a challenge.
- The level of computer skills of students participating in the course will vary. Some students will have to be taught how to use the technology in order for them to participate in the course whilst other students would be able to cope with the new technology.
- The design of the tutorial according to constructivist teaching principles will require active participation by students in the tutorial. Participation or the lack of participation by students on chat rooms, discussion forums and the submission of work will define the success of the course.

The literature review has given an insight into the main issues that underlie the development of the DISA online tutorial. It focused on issues relating to the main topics of this research: online training, metadata indexing, digitization and has indicated the need for online training programs to teach these skills in the South African context.

<center>**Chapter 3 - Research methodology**</center>

The research methodology was divided into three phases:

- Phase One – Development of the tutorial;
- Phase Two – Implementation of the tutorial; and
- Phase Three – Evaluation of the tutorial.

3.1 Phase One – Development of the tutorial
The tutorial was developed using

- The Open Learning System (OLS) of the Information Technology Education Department, University of KwaZulu-Natal to host the tutorial.

- Tools developed by the DISA Project that were used to conduct the tutorial. These included:
  a) Text help files in PDF (Portable document format);
  b) PowerPoint presentations;
  c) A Dublin Core metadata generator; and
  d) A set of DISA guidelines.

The development of the tutorial was done in consultation with the staff at the DISA Project offices in Durban. The metadata indexing specialist and the digitization technician at the DISA Project contributed to development and construction of the online tutorial.

The tutorial consisted of a digitization and a metadata indexing module.

The digitization module consisted of the following tasks:

- Scanning of documents into different file formats.
- Converting an image file into a text document and a PDF file.
- Cleaning a scan using photo imaging software.

The metadata indexing module consisted of:

- A TEI record creation exercise.
- A Dublin Core creation exercise.

Screenshots of this tutorial can be found in Appendix B.

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3.2 Phase Two - The implementation of the tutorial

The original plan was to implement the tutorial over a three week period. The tutorial was divided into a digitization and metadata indexing tutorial.

Sampling

The sampling method used to obtain participants for the tutorial was purposive sampling.

> The power of purposive sampling lies in selecting information rich-cases for in-depth analysis related to the central issues being studied. Purposive sampling can be used with both quantitative and qualitative studies (Commonwealth Educational Media Centre for Asia).

The criteria used to choose participants for the tutorial were defined as librarians and archivists with some work experience and knowledge of digitization and metadata indexing processes used within the library and archival professions.

Participants were selected from libraries and archival institutions in the KwaZulu-Natal region. The participants were invited to take part in the tutorial to learn new digitization and metadata indexing skills. The tutorial also offered an opportunity to participate in an online learning experiment. Ten individuals participated in the course.

An attempt was made to get participants from beyond South Africa. A notice was placed on the IFLA Digital Libraries Listserv. Some overseas individuals responded to the advert and gave indication that they wanted to participate on the tutorial. However, many of these individuals could not complete the registration procedures to obtain access using the email authentication facility. Often, after the student was registered, no further communication was received from the student.

Participation

A discussion forum that involved the majority of the participants in the tutorial was conducted on 21st October 2008. Ten persons participated in the first online discussion forum. Two students wanted to participate but were unable to get access to the OLS site. They therefore were unable to participate in the discussion forum.

The discussions on the tutorial were not fluent because most of the participants were using the tutorial for the first time.

Initially 12 individuals gave a commitment to participate on the tutorial. Two persons did not participate further on the tutorial. The reasons ranged from insufficient time to complete the exercises or poor access to the site, to problems with the site.

The tutorial was affected by the following factors.

- Poor participation;
- Internet access;
- Conflict with work hours;

- Inability to access the site from off campus; and
- The OLS site down time.

Poor participation
There was insufficient participation on the tutorial. There were a number of reasons for this which is provided in the analysis of email correspondence and the post course questionnaire.

Internet access
Some students had problems accessing the OLS site from off the UKZN computer network. Some students at times could not access the OLS site from computers linked to the UKZN computer network.

Conflict with work hours
A number of participants could not participate because of peaks in their work load toward the end of the year.

Access to the site from off campus
Some users who were based off the UKZN campus had difficulties connecting to the OLS site. They also encountered difficulties using the online learning tools and submitting completed work to the OLS server from off campus locations.

The OLS site down time
The OLS site and the DISA site that hosted the metadata generator would often experience downtime.

There were problems encountered during the running of the tutorial.

<u>The Digitization exercise</u>
This was attempted by seven students. Participation in this exercise was fair. Seven students submitted scans for the first scanning exercise. Three students submitted work for the scan cleaning exercise.

- There were problems uploading images in the scanning exercises because the OLS submission facility could not upload images that were too large. Participants had to use emails to post files. The images had to be sent individually to combat the image size problem.
- Some participants also had problems understanding the technical content of the tutorial.
- Some participants that did not have software to conduct the scan cleaning task did not download the free open source software to complete the cleaning of scans exercise. The participants that did the cleaning scans exercise used Adobe Photoshop software to conduct the tasks.

The Metadata indexing exercise
This was attempted by six students. Participation in this exercise was poor. Focus was given to the Dublin Core creation exercise as students attempted only this exercise and not the TEI creation exercise.

- Some students had problems with interpreting the instructions found in the exercise.
- Many participants could not complete tasks because of work pressure.
- A number of participants had to find time to participate in this exercise during the busy year end period at the institutions they worked at.
- One participant used another metadata creation tool available on the Internet to complete the metadata creation task. The metadata generator tool was often off-line.

3.3 Phase 3 – Evaluation of the tutorial
The evaluation of the DISA tutorial was conducted at the completion of the tutorial. The evaluation was conducted to ascertain the extent to which the web-based tutorial was a well researched product. The evaluation should contribute to making the tutorial a more valid teaching instrument.

The evaluation was conducted in two parts:

Part 1
The qualitative evaluation consisted of an evaluation of the discussion forum and email discussions to identify trends and significant thoughts that occurred throughout the tutorial. The data collected from the discussion forum and email correspondence was analyzed using interpretative methodologies. The interpretative methodology used consisted of coding the significant thoughts and opinions that were evident within the email correspondence and the discussion forum. The significant thoughts and opinions that were found in both "instruments" were collected and tabulated.

The qualitative evaluation identified important concepts and thoughts evident during the running of the metadata indexing and digitization tutorials. The researcher was a participant on the discussion forum. The following issues were identified in email messages and discussions on the discussion forum:

- Positive and negative aspects of the digitization and metadata indexing tutorial encounter by students
- The submission of work
- Problems regarding tasks to complete
- Co-operation and sharing of knowledge amongst participants.

Part 2
A post-course quantitative and qualitative analysis was conducted using a questionnaire that was completed by the participants. The questionnaires were emailed to participants on completion of the tutorial.

This analysis of the quantitative questions was conducted using SPSS™ software. The quantitative analysis provided statistical data for the research. The qualitative analysis provided information on the number of interactions on the chat and discussion rooms, the number of postings on tutorials, submission of work, independent use of resources, co-operation amongst students, and contribution to group work during the course and rating of the course.

The qualitative analysis questions identified the main issues participants had regarding the following issues:

- Internet access issues related to the tutorial;
- The level of participation by students on the tutorial;
- The learning experiences gained on the tutorial;
- Positive and negative responses to the course;
- Co-operative learning on the course; and
- Responses to the concept of online learning.

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Cross-referencing was conducted on the quantitative and qualitative data to check for inconsistencies or anomalies to allow for triangulation. This allows for the comparison of relationships and differences between quantitative and qualitative results. Linking qualitative and quantitative research methods gives an indication of the validity of the research.

> In social science, triangulation initially referred to the claim that comparing a finding from two or more different research methods enables the researcher to conclude whether an aspect of a phenomenon has been accurately measured, just as comparing several measurements of a geographical area allows a more accurate mapping of the territory (Moran-Ellis et al., 2006).

The web-based tutorial was evaluated to determine if it was a successful teaching instrument. The evaluation could provide evidence that would indicate whether the online tutorial was a success or not. The evaluation would contribute to any future online learning programs that would be conducted by the DISA Project.

Chapter 4 - Data analysis and presentation of results

The data analysis consists of:

- A qualitative analysis of email correspondence between the participants on the tutorial and the facilitator;
- A qualitative analysis of the discussion forum hosted on the tutorial; and
- A qualitative and quantitative analysis of a post-course questionnaire.

A thematic analysis of the email correspondence and discussion forums was conducted to identify the main themes and issues that were discussed on both these communication tools. In addition, a post-course questionnaire was developed and presented to participants upon completion of the tutorial to obtain qualitative and quantitative data from them about their learning experience on the tutorial. The questionnaire consisted of 10 open-ended questions and eight closed questions.

The data analysis conducted on these three resources was used to provide answers to the research questions. The research questions investigated three important issues regarding the feasibility of the DISA online tutorial as a teaching tool. The qualitative and quantitative data obtained, applicable to each of the research questions, will be presented.

The 10 participants that completed the questionnaire were all professional librarians. Nine of the participants worked at library and archival institutions in the KwaZulu-Natal region. Three of the participants from this group had library degree qualifications, two had library diplomas and four had masters' degrees in library and information science. The single overseas participant possessed a master's degree in library and information science and worked for an archival institution in the Netherlands. He was at the time involved in the development of digital libraries and archives in Southern and Eastern Africa.

4.1 Research question one
Does the use of constructivist teaching elements in the tutorial design allow for a more effective communication of knowledge and skills?

A constructivist learning environment must ensure that communication and collaborative learning is possible amongst learners. The DISA online tutorial contained two communication learning tools, that is, a discussion forum and a chat facility to enable communication and a collaborative learning experience amongst learners. The chat room facility was not used. Instead participants chose to use email correspondence with the tutor and a session on the discussion forum to communicate on issues related to the tutorial.

There were 10 email queries from overseas persons regarding registration for the tutorial. Only one of the overseas individuals who responded to the advert placed on the IFLA (International Federation of Library Associations) digital library listserv eventually participated in the online tutorial.

The overseas participant used email to discuss technical issues of the digitization processes and the use of the Dublin core metadata generator in the metadata indexing tutorial. He also requested clarity on the functionality of the subject-naming tool in the Dublin Core metadata generator.

4.1.1 Qualitative analysis of email correspondence
The participants used the email tool to discuss problems they encountered on the online tutorial. There was minimal use of the email for collaborative learning or information sharing. The majority of the participants' email dialogue during the tutorial was conducted mainly with the facilitator of the tutorial. There was little evidence of email correspondence amongst learners within the group regarding tasks conducted on the online tutorial. Thus collaborative learning which is an essential part of a constructivist teaching principle was not a part of this learning. The email was used mainly for:

- Posting queries about the tutorial to the researcher; and
- Resolving problems experienced by participants when accessing the OLS site.

Eight specific issues were identified in the analysis of the email correspondence during the running of the tutorial and these were:

- Registration issues (password creation);
- Work commitments of participants;
- Time scheduling of the course;
- Problems with the OLS site functionality;
- Internet access issues;
- Completion of tasks;
- Metadata generator issues; and
- Scanning issues.

Many of the issues that were identified in the email analysis corresponded with the main themes and issues identified in responses given to questions in the post course questionnaire.

4.1.2 Qualitative analysis of the discussion forum
There was limited participation in the discussion forum through the duration of the online tutorial. Most of the activity on the forum was conducted on the first day of the tutorial when the majority of participants participated in the first scheduled discussion forum. In this discussion participants introduced themselves and provided details of their current job descriptions and their work experience in digitization and metadata indexing.

The issues discussed were:

- Participants' digitization experience: - the majority of the participants stated that they had limited digitization experience. The experience of participants ranged from seven participants who had a basic understanding of digitization and

metadata indexing concepts and processes, to three persons who had participated in more advanced metadata and digitization training. One participant stated that he had been involved in a digitization project at his place of employment.

- Any previous participation in an online learning environment - one participant had participated in a training course on WebCT while another stated they had exposure to OLS mentioning that both are software programs for the management of online courses.
- Quality control procedures for digitization focusing on the file size, format and naming of digital images: a participant discussed quality control procedures implemented at the DISA Project.
- Participants previous work experience with digital image formats - two participants discussed the following formats: JPEG, BITMAP, GIF, PNG and PDF. Participants also discussed GIMP and Adobe Photoshop imaging software that would be used to edit scanned documents.
- The reasons for developing file naming conventions.

During the implementation of the tutorial, participants preferred to use the telephone or the email to post queries to the researcher about the tutorial rather than use the discussion forum, in spite of many requests to do so by the facilitator. The lack of use of the discussion forum by participants limited their collaborative learning. The poor use of this forum removed the possibility of communication amongst learners as well as an important element that the research intended to focus on.

Participants simply did not join scheduled chat rooms and discussion forums. A number of the issues that were outlined in the methodology section (such as poor Internet access, work commitments and OLS downtime) also affected participation on the discussion forums. These conditions also contributed to the poor interaction amongst participants on the tutorial. Participants accessed the site at different times to their colleagues, that is, when time permitted. This did not allow the class to participate in the learning activities as a group.

A number of technical and Internet access problems restricted participation on the online tutorial. These problems presumably also contributed to making the use of the discussion forum difficult. The effective use of the discussion forum was an important requirement to create a collaborative learning environment and promote a constructivist learning experience.

In the post-course questionnaire, participants were asked if they had used the discussion forum on the tutorial. Participants who responded, no, were asked to provide reasons why they had not used the discussion forum. The results are depicted below.

Figure 1: Use of the discussion forum
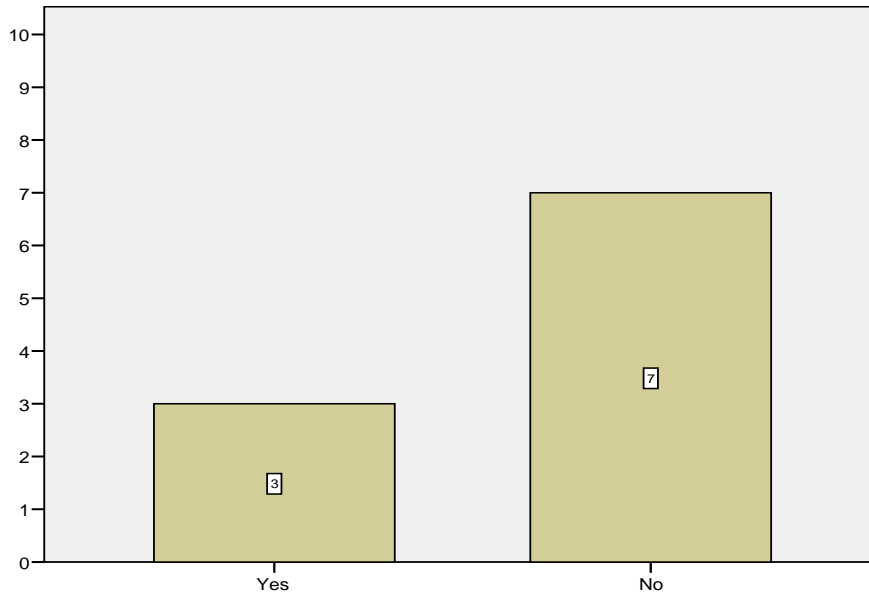
Three participants stated that they had used the discussion forum on the online tutorial whilst seven participants stated that they did not.

Some of the respondents who indicated that they did not use the discussion forum gave the following reasons for not doing so**:**
- "I tried once but could never see my comments"
- "The Internet was slow and took up a lot of time"
- "Never saw a need to use the discussion forum"
- One participant blamed the lack of live discussions as a reason for not using the discussion forum stating that "Not everyone was online and they were not all at the same level of expertise".
- Another participant stated that he did not participate because initially he thought the discussions were going to be a live group discussion. He also cited a lack of time required to read through discussions as a reason for not using the discussion forum. The participant said "Though I could have participated in "asynchronous" fashion – at first I thought the discussion were live sessions like chat boxes – I nevertheless lacked the time to read, understand and respond to the discussions".

Regular participation in the online tutorial was an important element that was required for collaboration, discussion and sharing learning skills. Participation was poor, because participants did not access the site regularly, they did not take part in discussion forums and they submitted work late. A number of issues contributed to the poor participation in the tutorial. Participants accessed the site at different times and could only access the

tutorial when time permitted. Technical issues, such as the malfunction of the learning tools on the site, and Internet access problems, inhibited participation in the tutorial. Participants were also reluctant to make use of communication tools on the tutorial and initiate discussions on the tutorial. This was because they felt uncertain and threatened because the concepts that were being taught were new to most of them. These factors made it difficult for participation in the learning activities as a group.

There was a lack of collaborative learning in the tutorial. Some participants did not access the tutorial daily due to failed Internet access, work pressure or they did not have access to the Internet from their homes.

4.1.3 Responses to questions on participation on the online tutorial
In the post course questionnaire participants were asked if they did not participate in some parts of the tutorial and to provide the reasons for their lack of participation.

Figure 2: Non–participation in some parts of the tutorial.
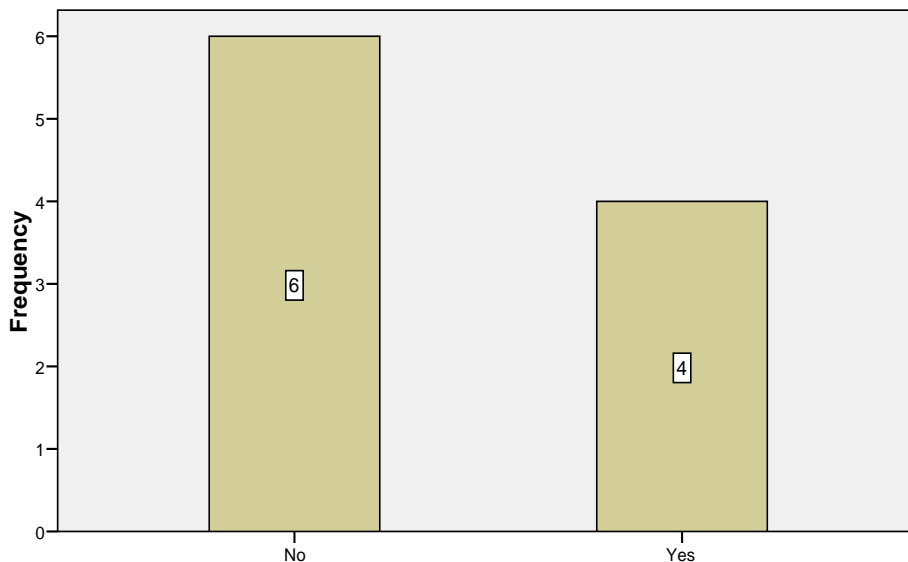
Those participants who did not participate in some parts of the tutorial were asked to provide reasons why not.

Participants listed the following as reasons for lack of participation.

- "Did not realize how much time was required to participate in the tutorial"
- One participant indicated that participation on the tutorial was time consuming adding that "The course is thorough – and it includes a lot of reference material that has to be read and digested too".

Time constraints were common for all participants who were full time employees, who found it difficult to allocate time to complete tasks.

- "Did not understand some aspects of the tutorial"
- "Struggle to understand the instructions. Ended up getting lost and eventually not knowing what to do".
- "At times I struggled to understand the instructions".

For many participants learning online and dealing with new subjects, metadata indexing and digitization made learning difficult.

- "Access to scanners was not easily available for some participants at their place of employment".
- "Network problems were frustrating as well as the lack of a scanner"
- "Time constraints and access to the network".

Access to the required hardware and software to complete tasks was limited for participants. Participants did not use scanners for their daily tasks hence it was a problem to complete tasks. The poor Internet access to the UKZN network and the OLS site itself were indicated throughout this study.

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Figure 3: Sufficient time to participate on the tutorial
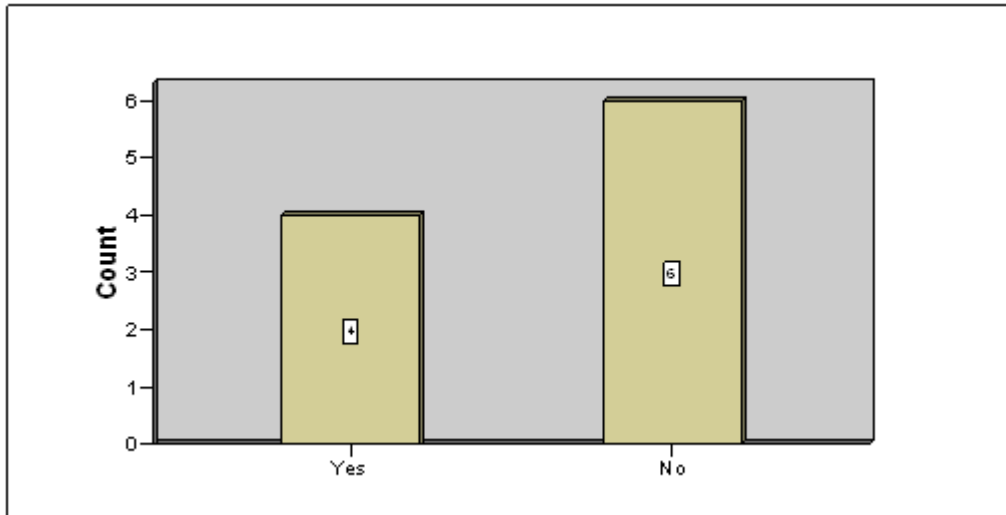
Six persons stated that they did not have sufficient time to complete exercises on the tutorial. An important reason for this was the fact that all the participants were fulltime employees. They often could only gain access to the online tutorial from their places of employment. In some cases the work pressure had increased during the tutorial and they could not find the time to participate.

Figure 4: Tutorial interference with work schedule
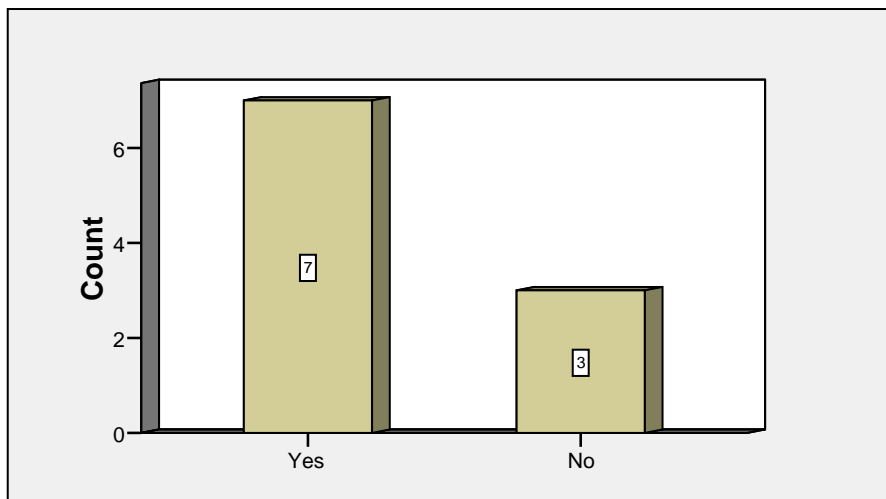
Seven participants stated that the tutorial did interfere with their work schedule whilst three said it did not.

There were also a number of technical issues and Internet access problems that restricted access to the tutorial and affected the hosting of the tutorial and these are described below.

Problems with Internet connectivity and UKZN server issues
The tutorial was affected by the poor Internet connectivity to the OLS site at various times. The OLS site is hosted on computer servers based at ITD (Information Technology Division), UKZN Durban campus. In the quantitative analysis of the email correspondence with learners, participants stated that they had encountered difficulties accessing the OLS site from academic institutions and households in the surrounding Durban area. A number of participants reported these access problems in postings on the email correspondence and in responses to questions in the questionnaire.

In the questionnaire participants were asked if they had any problems accessing the Internet whilst completing the tutorial.

Figure 5: Problems accessing the Internet
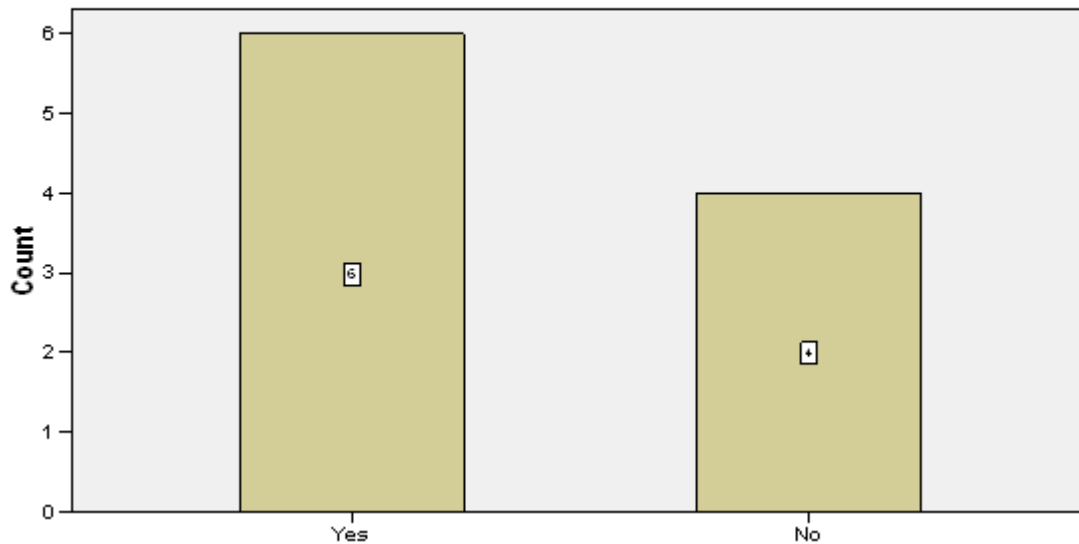
Six persons gave yes responses stating that they had problems accessing the Internet during the running of the course. Two of the persons stated that they had the Internet access problems when attempting to access the tutorial from other campuses. Another participant listed poor access to the tutorial from home as a problem.

Figure 6: Access to the OLS site via the UKZN network
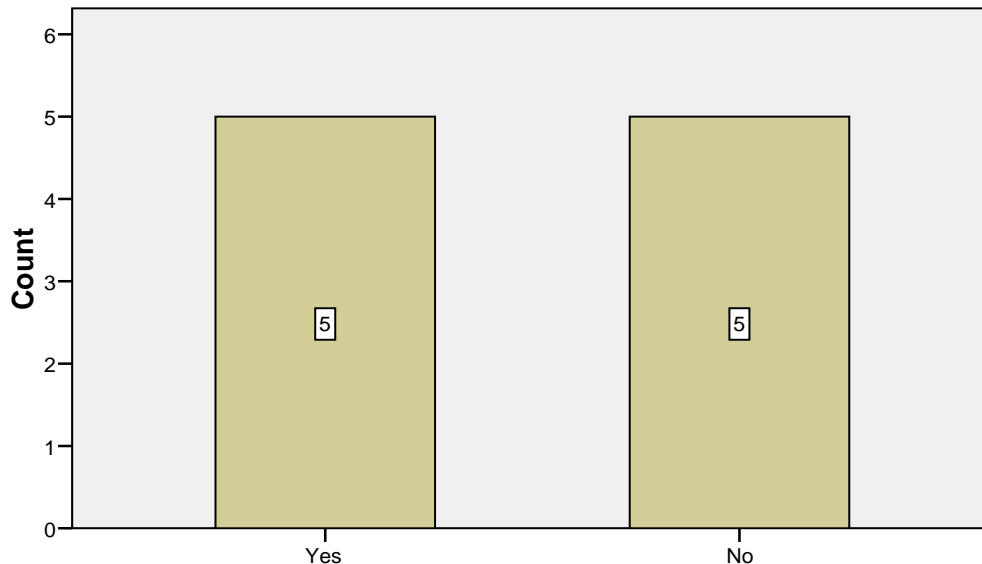
Participants that accessed the site from computers located off the UKZN campus experienced many problems when attempting to gain access to the site as well as when attempting to use learning tools on the site.
 Some of the problems were:

- The submission tool could not be used to submit scanned images.
- Two participants from another campus could not access the Dublin Core metadata generator to do the metadata indexing exercises.

The majority of the participants accessed the tutorial from their places of employment. Two participants had Internet access at home and were able to do tasks after working hours. These participants also stated that they did have problems accessing the site from off-campus but not when they accessed the tutorial on the university network.

On the post–course questionnaire participants were asked if there were any other factors that hindered access to the OLS site. In response, one participant stated that they had problems accessing the site from off campus but not from the university network. "When working from campus (work) there were no problems but remote access posed difficulties."

Two participants stated that they had problems completing the registration process. This was regarded as a factor that hindered access to the OLS site. There were also occasions when the DISA server and the OLS server went down. The OLS system also did not function at various times. The problems encountered when attempting to access the OLS website hindered participation on the tutorial.

Figure 7: Other type of Internet access
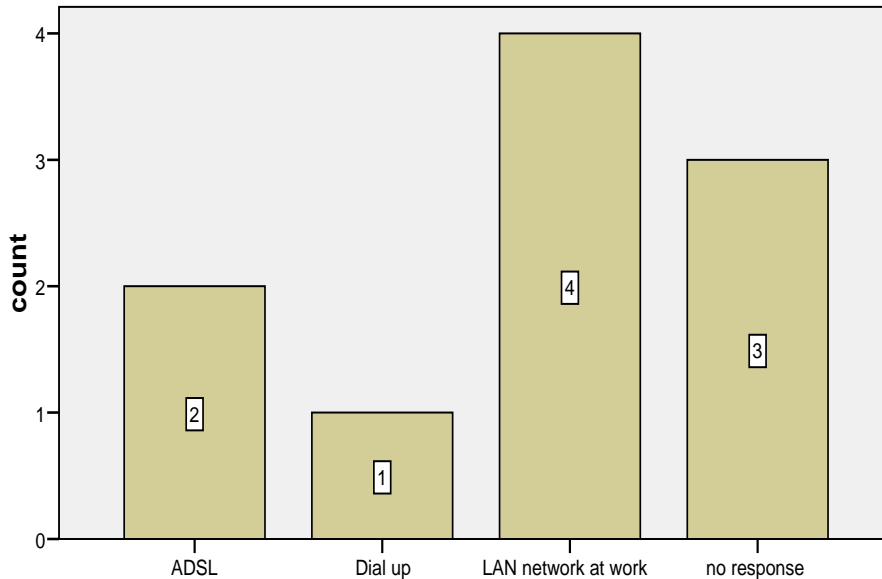
The diagram shows that most participants accessed the tutorial from a LAN (Local Area Network) at their place of employment. Only two participants accessed the site from ADSL (Asymmetric Digital Subscriber Line) and dial-up connections. There were three "no" responses.

4.2 Research question two

Is the online tutorial a teaching instrument capable of teaching metadata indexing and digitization skills?

To establish if metadata indexing and digitization skills could be taught on the online tutorial participants were asked questions about tasks that they had completed on the tutorial. Participants were also asked if they had learnt digitization and metadata indexing skills on the tutorial.

4.2.1 Assessment of skills learnt on the tutorial

Chart 1: Digitization skills learnt on the tutorial
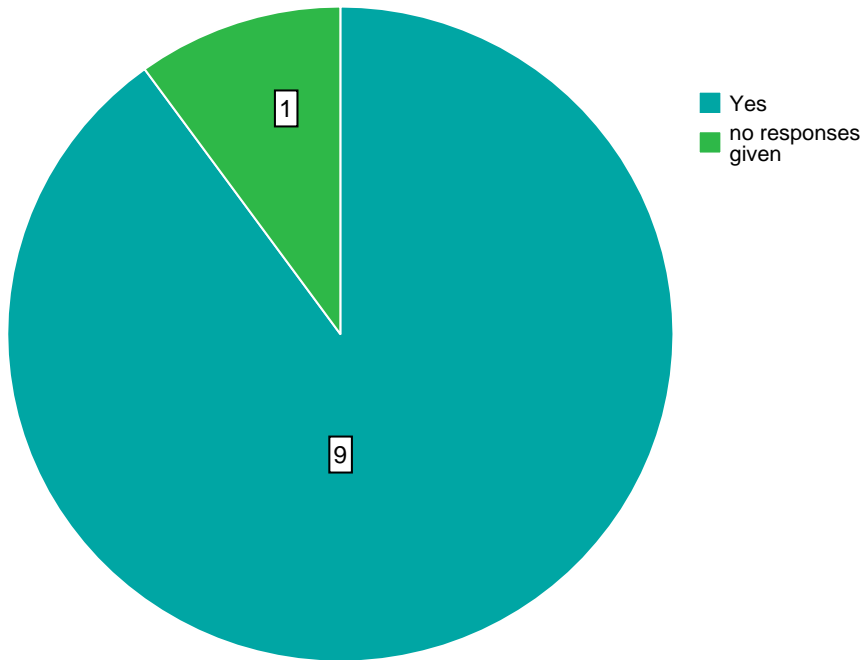
The pie-chart shows that the majority of the participants indicated that they did learn digitization skills on the tutorial.

Chart 2: Metadata indexing skills learnt on the tutorial
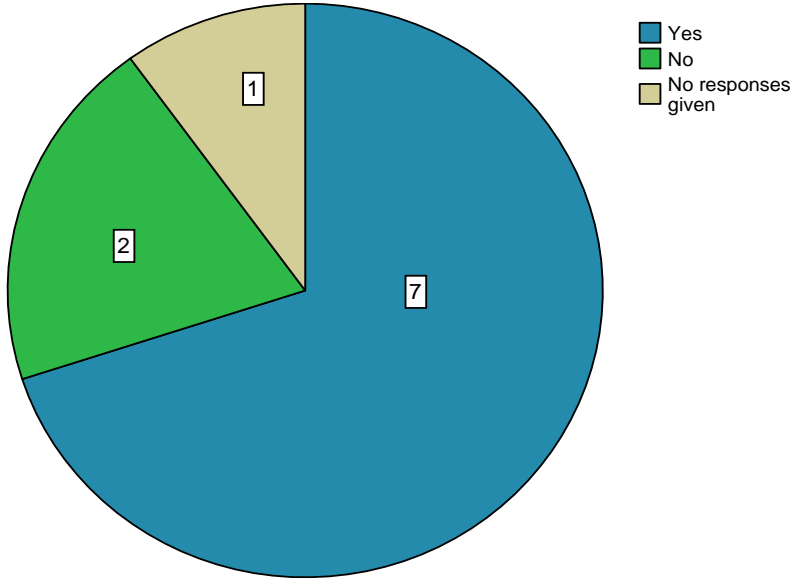
The pie-charts show that the majority of the participants indicated that they did learn digitization and metadata indexing skills on the tutorial.

4.2.2 Assessment of work submitted on the tutorial

The research also sought to ascertain the amount of work that was submitted for the scanning and metadata indexing tasks. Participants were asked how many scanned images and metadata records they had submitted for the scanning and metadata creation exercises respectively. Forty three scans were submitted for the scanning exercise and 23 metadata records were created for the metadata indexing exercise.

Figure 8: Number of scans created
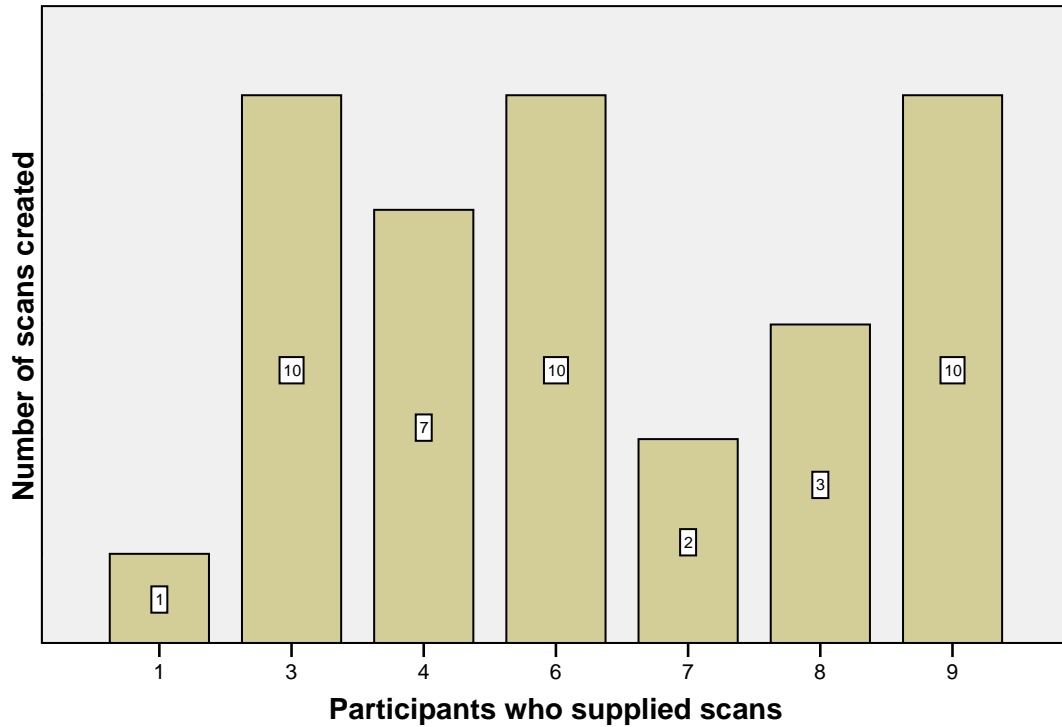
Figure 9: Number of metadata records created
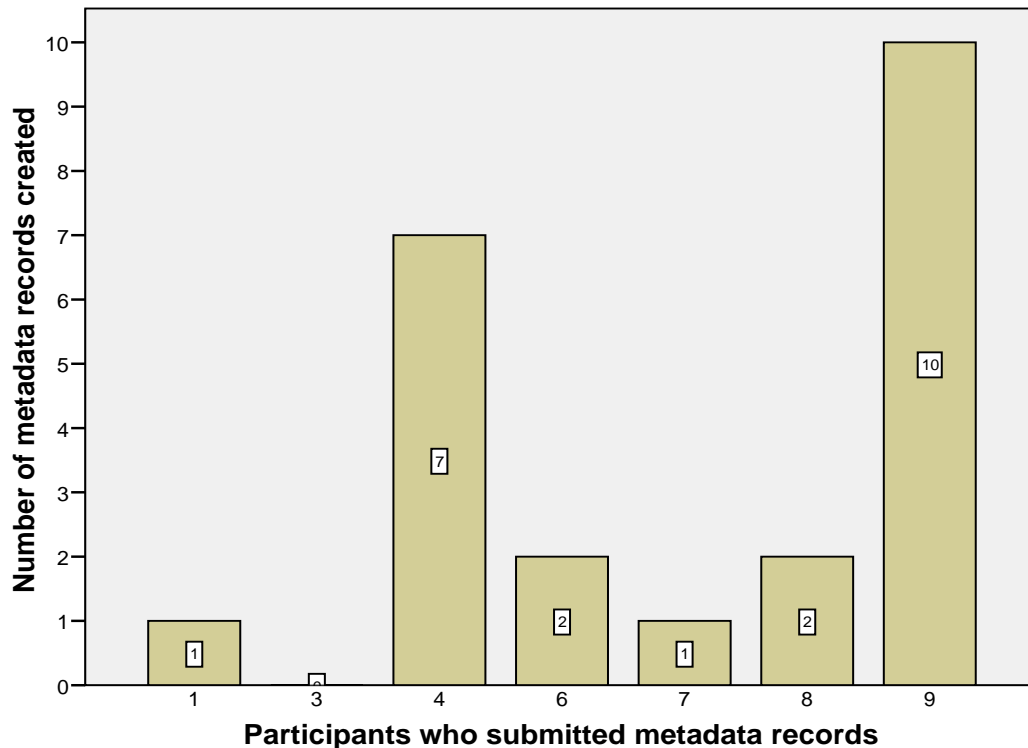
The two Figures 8 and 9 indicate that the majority of the participants did submit scans and create metadata records. For the first scanning task participants had to create eight scans of documents. They were instructed to save these documents according to the different image file formats, file size and colour specifications. For the second scanning exercise participants had to clean 14 scanned images and submit these images.

For the metadata indexing tasks participants were required to create 15 Dublin Core metadata records of documents found in some South African historical digital repositories.

Participants were then asked if there were any of the digitization and metadata indexing concepts in the tutorial that they found difficult to understand. They were asked to elaborate on their responses irrespective of whether they replied positively or not.

Figure 10: Difficulty in understanding digitization and metadata indexing concepts
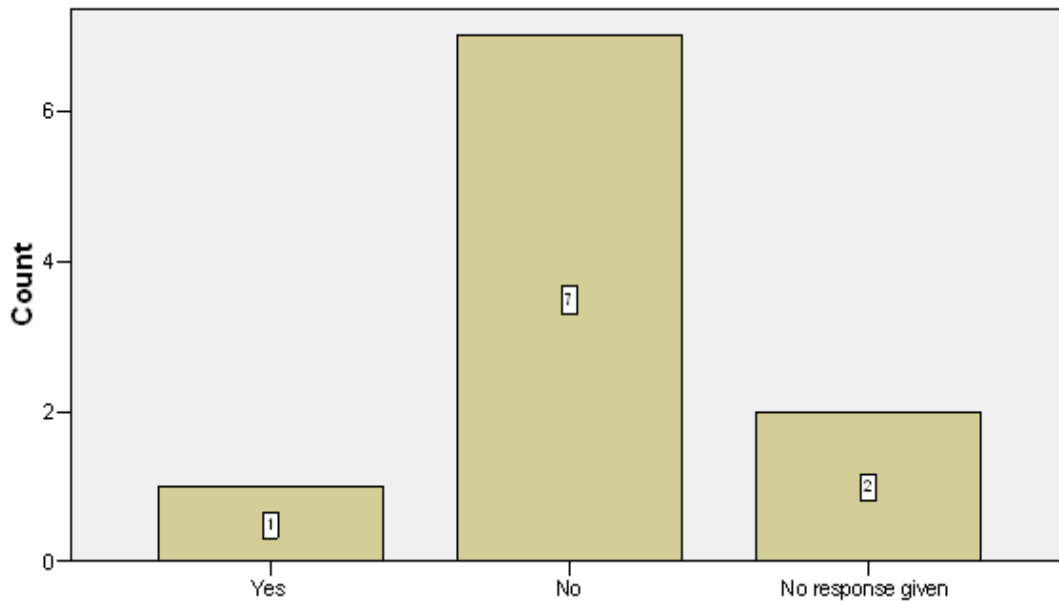
Were any of the digitization and metadata indexing concepts in the tutorial difficult to understand?

Respondents were asked to elaborate on their responses.

The one participant who gave a "Yes" response stated that "At first it was difficult and later as I did more it became easier and I had a better understanding of the indexing concepts."
Of the seven respondents who said "No" only two elaborated. The first stated that "It was not difficult, but required time to grasp"; while the second said
"It was easy, and well written, giving many access options to tools when required".

4.2.3 Assessment of the tutorial as a learning instrument

Participants were then asked if they were able to understand the technical requirements for digitization and metadata indexing for each task.

Figure 11: Understanding of the technical requirements for digitization and metadata indexing.
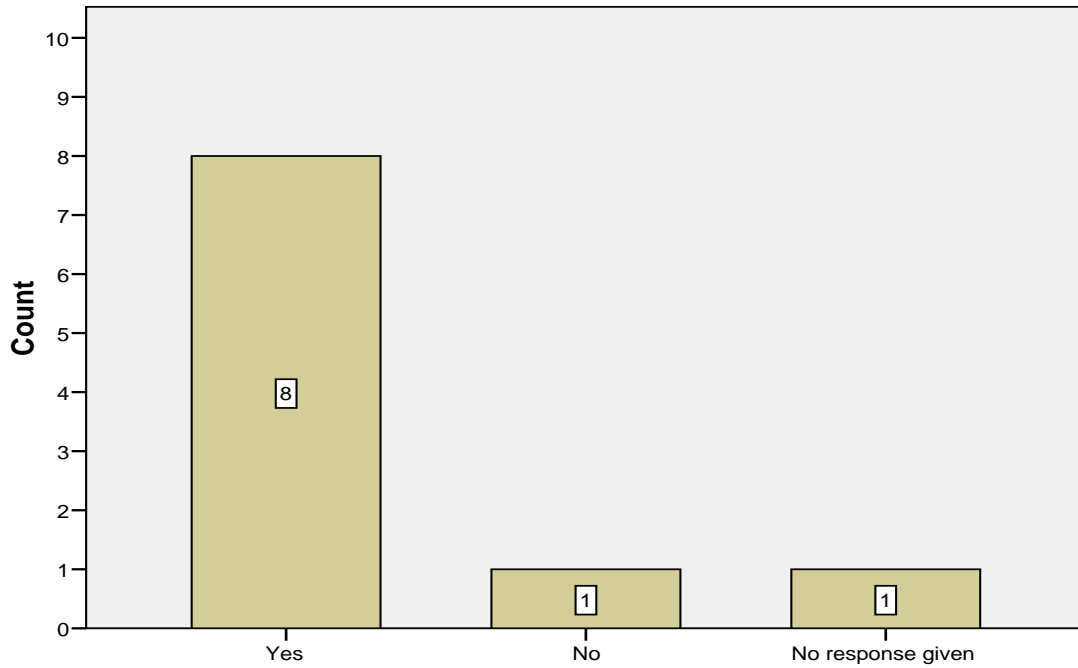
Did you understand the technical requirements for digitization and metadata indexing?

As can be seen in Figure11 above, eight participants stated that they did understand the technical requirements for digitization and metadata indexing. A single no response was received because the participant stated that he "did not understand the complex text instructions that were provided".

Participants were asked to rate the tutorial as a medium to teach digitization and metadata indexing.

Figure 12: Rating of the tutorial as a medium for teaching digitization and metadata indexing.
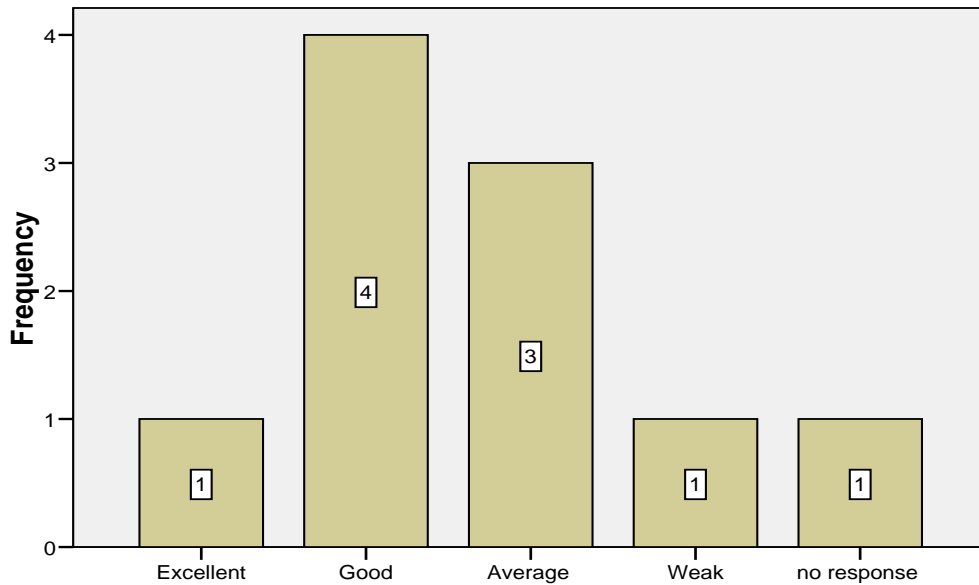
Rate the tutorial as a medium to teach digitization and metadata indexing

The results indicate that half of the participants rated the online tutorial favourably as a medium to teach these skills. Only one participant rated the online tutorial as weak.

4.3 Research question three

Is the online tutorial an effective teaching tool?

The questions in this section were designed to ascertain if the online tutorial was an effective teaching instrument. The questions focused on the following issues

- The usability and design of the tutorial
- Technological issues that affected participation on the tutorial
- Access to the relevant computer hardware and software.

Participants were asked to rate the tutorial as a teaching instrument to teach digitization and metadata indexing skills and to provide any comments regarding their participation on the tutorial.

Participants were asked for their opinion of OLS to ascertain if it was acceptable as a learning tool for the participants. The question was designed to establish if students were able to complete learning tasks in the OLS learning environment.

4.3.1 Usability of the tutorial

Figure 13: Ease of use of OLS.
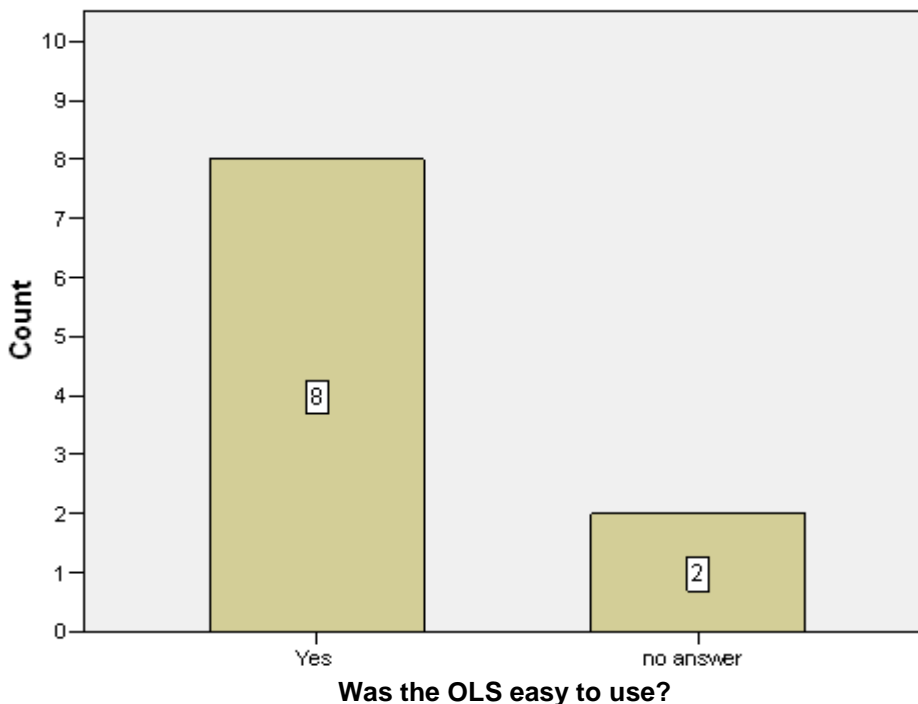
The majority of participants indicated that the OLS was easy to use.

4.3.2 Computer skills of participants

Participation on the online tutorial required participants to use a number of computer technologies and web-based resources to complete the tasks. The research question was designed to ascertain whether the level of computer skills amongst participants influenced their ability to complete tasks on the tutorial.

Figure 14: Lack of completion of tasks due to lack of computer skills
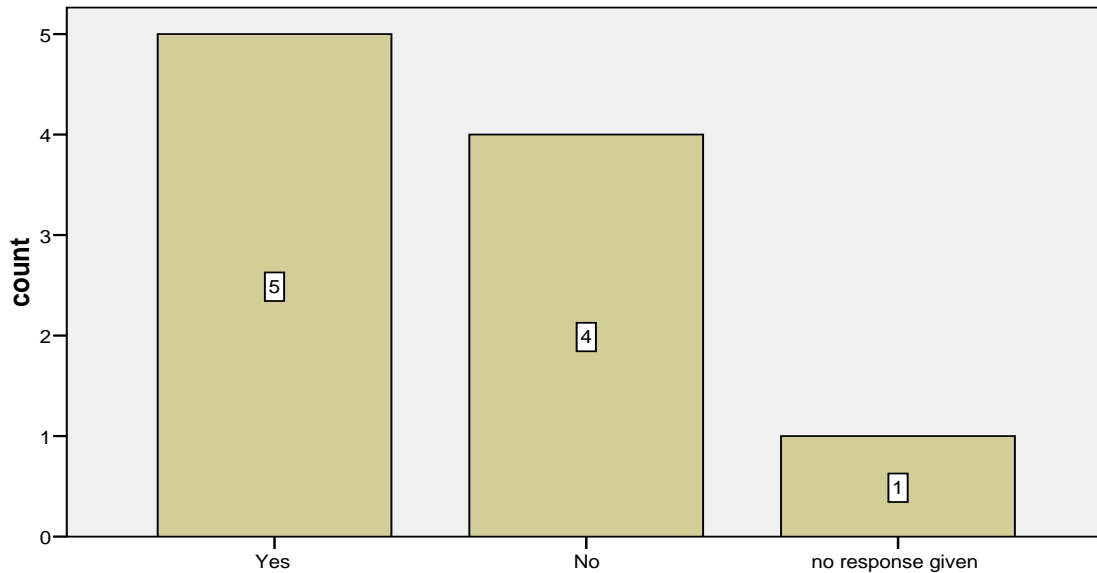
Any tasks you did not complete because you lacked the computer skills required to complete the task?

A participant who gave a "Yes" response stated that "the skills required for the scanning tasks were difficult for me and I struggled with this".

4.3.3 Access to computer hardware/software

The next question was designed to find out whether participants had access to the necessary hardware and software to complete the work exercises. This would indicate whether a participant's ability to complete tasks was affected by access to the necessary computer hardware and software.

Chart 3: Able to access the required computer hardware and software
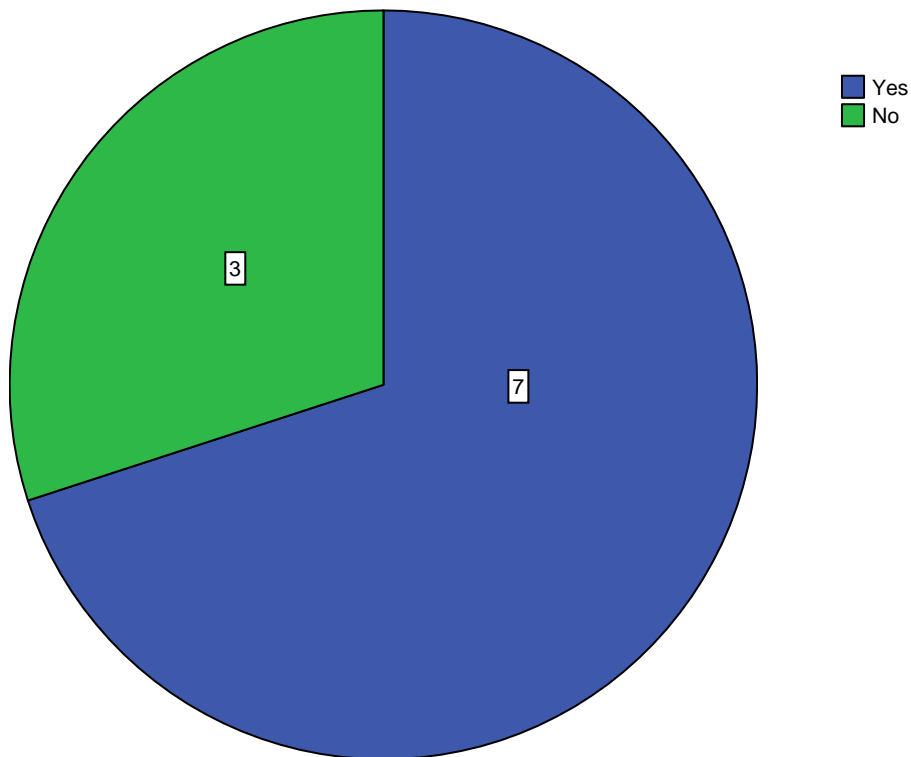
Three participants posted a no response. They listed not having access to scanners required to complete tasks. Although the institutions at which they were based did possess scanners, the participants stated that to obtain access to the scanner was difficult because it was often assigned only to the person responsible for conducting scanning for the organization. The scanner was not easily available to persons who did not have work related to scanning tasks.

One of the three participants cited the inability to access the metadata generator when the server that hosted the metadata generator could not be accessed. The metadata generator could not be accessed from the DUT campus where two participants tried to complete the Dublin Core creation exercise. The metadata generator also did not function at other times. The metadata generator would often crash because of problems with the DISA server that hosted this tool. The technician at DISA had to frequently reboot the server hosting the metadata generator.

One of the three participants cited inability to upload their work to the OLS site as a hardware problem. This problem relates to the inefficiency of the OLS system at the time. Many participants reported in their telephonic and email correspondence with the researcher that they could not access the OLS system at various times during the course.

Some participants stated that the failure to gain access to the OLS site was a computer hardware access problem.

To establish if the participants encountered any problems completing exercises on the online tutorial they were asked if they were unable to do any of the exercises on the tutorial.

Figure 15: Unable to do any of the exercises

Were you unable to do any of the exercises?
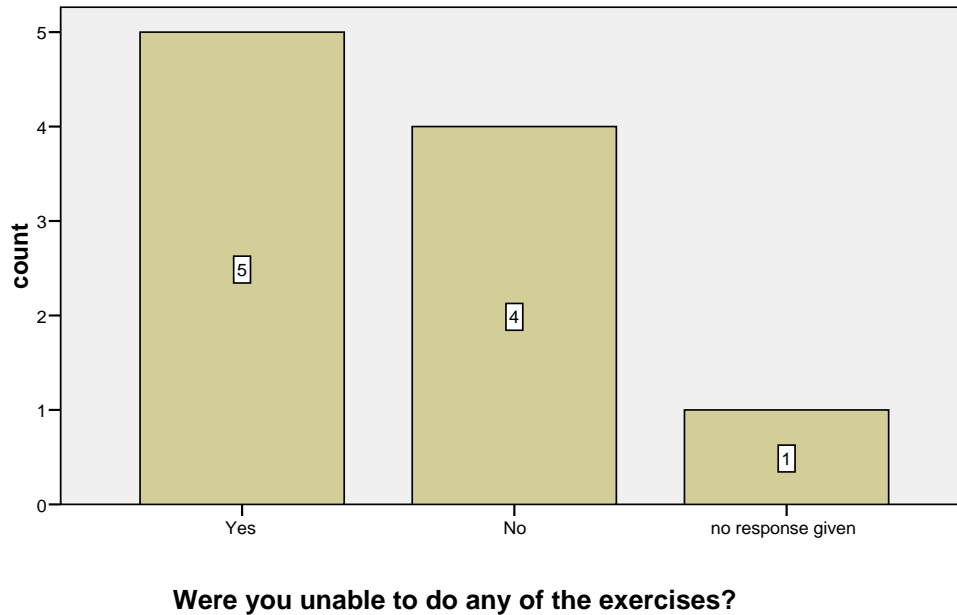
When asked why they were unable to do any of the exercises, the reasons given are as follows:

- Time constraints and the workload at the participant's place of employment;
- Problems with uploading documents in the tutorial that caused them not to complete the tasks;
- They did not have access to the Internet from home or access to a scanner to complete digitization tasks; and
- The Dublin core generator did not function at various times on the OLS site and at other times it could not be accessed from other institutions.

The design of a learning environment can enhance learning if it is well planned and will hinder learning if the design is complicated and difficult to understand. Participants were asked if the learning tools, the subject content and the design of the tutorial assisted the learning process.

Figure 16: Learning tools, subject content and design of the tutorial assisting in the learning process.
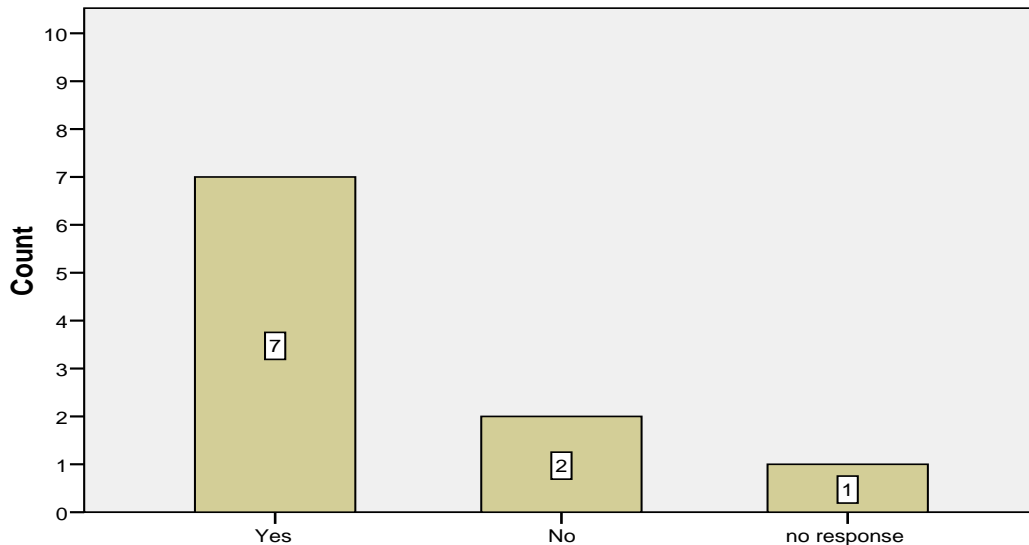
Did the learning tools, the subject content and the design of the tutorial assist the learning process?

Seven participants voted yes and two participants voted no. Participants were asked to provide reasons for their answers.

There were mixed responses to this question. Some participants stated that the learning tools, the subject content and the design of the tutorial did assist learning processes whilst other participants expressed concern about the design with regards to the interpreting of the instructions on some of the exercises and obtaining feedback on tasks completed.

The following are the responses given by participants:

4.3.4 Learning tools
Participants stated they "found the guides very helpful" and "The guides were clear." Another participant said "It took great creativity for someone to design such a tutorial." "Everything to learn and exercise was right there in front of me. And after an upload of exercise results I had feedback from the course leader / teacher".

4.3.5 Subject content
There was also a suggestion from a participant that the tutorial should be designed for groups with similar skill levels in digitization and metadata indexing, i.e. either for beginners or advanced learner groups. He said "For beginners online training of 'digitization' and 'metadata' does not work – only real world training in a real classroom with a scanner".

He also stated that "the instructions should be user-friendly to facilitate more participation on the tutorial".

4.3.6 Tutorial design

Some participants expressed concerns about the design of the tutorial with regard to interpreting instructions and obtaining feedback on tasks completed.

The concerns were:
- "Though the feedback was prompt and personal rather than computer-generated (like in some computer assisted training), the feedback loop of course takes longer and makes the learning getting interrupted and less direct".
- "Some of the instructions were a bit unclear. I had to call the researcher to clarify things that did not make sense"

The design of the tutorial was found to be complicated by some participants. This view at times was related to the participants' lack of computer skills required to conduct tasks.

Figure 17: Rating of online learning based on experience on the tutorial
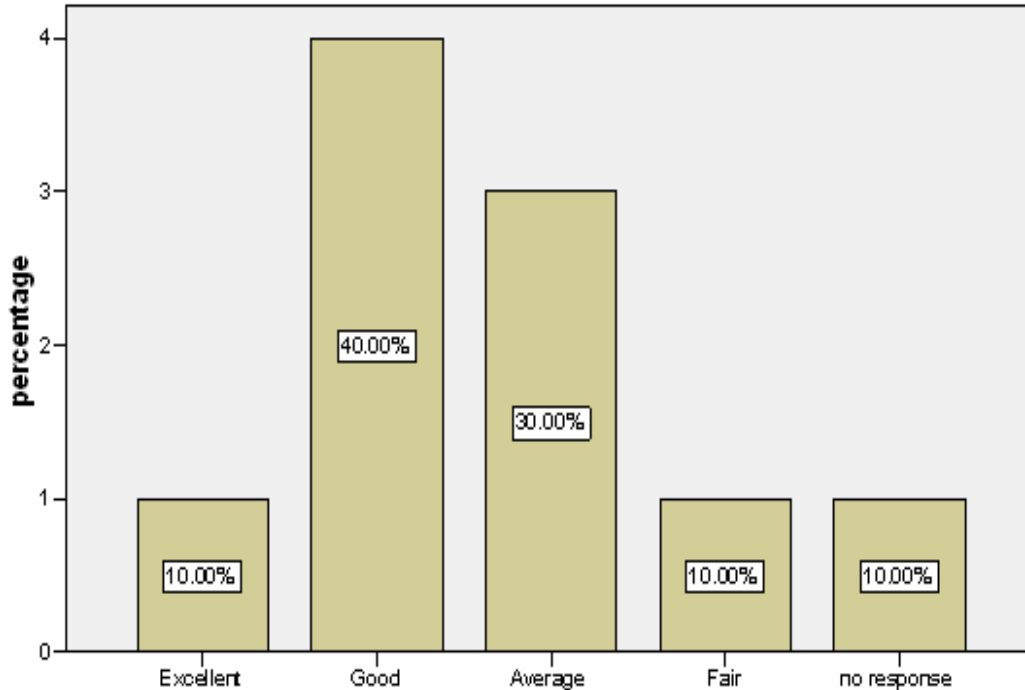
Rate online learning based on your experiences on this tutorial

Figure 17 indicates that 50% of the participants believe that the online tutorial was either a good or excellent teaching instrument, 30% of participants rated the tutorial as average whilst 10% of participants rated the tutorial as fair. There was a 10% no response.

For the last question participants were asked to make a note of any other comments they had concerning their experiences on the tutorial.

A total of nine comments were given.

The comments received have been listed as compliments, criticism or advice received.

4.3.7 Compliments given by participants
Two participants stated that they had benefited from participating in the course. The first participant said the skills learnt from the course helped her in her present employment. Another participant complimented the design of the tutorial. The participant stated that access to OLS and other tools required to complete tasks on the tutorial were made available. The other complimentary comments were:
- "The content is top class."
- "I think the tutorial was well thought out and created. The issues with access to OLS were a bit of a problem, but the researcher made provision for that and was able to rectify ASAP".

4.3.8 Criticism given by participants
A participant expressed a view that attempting to impart these skills to beginners in an online environment is difficult. He said "for absolute beginners online training of "digitization" and "metadata" does not work – only real world training in a real classroom with a scanner, PC's, a trainer etc. Learning to operate a scanner is simply too physical, too much hands-on. Same with the concept of metadata and the concept of attaching metadata to a scanned or OCR-ed image: you have to demonstrate what happens 'inside the digital library'.

Another participant said "Online learning should be well planned and tried out before implementation to iron out all problems. It can be frustrating when you are not sure what you are doing."

4.3.9 Advice given by participants
One participant commented that: "The researcher should test the tutorial on a more formal group of library science students at Durban Institute of Technology". There was also a recommendation that the "instructions should be user-friendly". In this regard the participant said: "It would be better to have a flow with short introductions of concepts including quotations of third party material (hyper linking to relevant sections), then do an exercise and upload, then have a break in the flow to await the teacher's comments, then start with the next introduction, etc".

There was advice given regarding the functionality of some parts of the metadata generator:
"Drop down menus to prompt the creator of records should be available throughout the generator". Finally, one participant referred to a problem relating to backup: "There should be some backup mechanism to save information captured preventing having to retype all information when a record is lost midway".

The comments given indicate that some students perceived the tutorial as beneficial and some students believed there are parts of the tutorial that should be improved. Some

participants stated that they had benefited by learning skills in a well-structured learning environment. The other participants called for improvements to the design of the tutorial and asked for the tutorial to be designed for either a beginner or advanced learning group. These comments show that learning was achieved although this achievement had limitations in the opinion of other participants.

Chapter 5 - Discussion of results

This discussion will comment on the results obtained. The results that were unexpected and unsatisfactory are explained. Attention is given to the results that were unsatisfactory. The results that are unexpected and unsatisfactory indicate areas that can be improved.

The discussion will be conducted on the results related to each of the three research questions as listed in Chapter 1. The first research question asked:

- *Does the use of constructivist teaching elements in the tutorial design allow for a more effective communication of knowledge and skills?*

The aim of the research was to promote a constructivist teaching philosophy by enabling effective communication of knowledge and skills on the tutorial. The effort to establish a constructivist teaching scenario was affected and influenced by the following issues:

5.1 The poor use of communication tools on the tutorial
There was poor use of communication tools on the online tutorial. Participants did not take part in scheduled discussion forums and chat sessions on the tutorial. This denied them the opportunity to share knowledge and discuss problems regarding the exercises given on the tutorial. The poor use of the communication tools was related to the following issues:

- The problems learners experienced attempting to access and use the learning environment;
- The tools on the learning environment which did not function properly;
- There was limited technical support available to ensure that the learning environment was accessible and efficient at all times; and
- Work commitments of participants.

These issues have to be resolved to enable the use of communication tools for shared learning and communication between and amongst the learners. Participants on the online learning tutorial should have had sufficient opportunities to access the online tutorial. However, this was not the case and the failure of participants to participate in scheduled times for discussion forums and chat rooms because of this eliminated opportunities to use the communication tools for live discussions. The use of communication tools on the online tutorial is vital to create a collaborative and cooperative constructivist learning experience.

Another factor that hindered the promotion of a constructivist learning experience on the tutorial was the limited participation of students on the tutorial.

The registration process was the first process that hindered participation of persons. The malfunction of the registration process stopped the participation of overseas individuals who had shown interest in participating on the tutorial. The overseas students were not able to receive the system-generated password from the OLS server. This frustrated these

students who could not access the OLS site and subsequently they did not participate in the course.

For those who did register, the inability of participants to access the OLS site at various times and the malfunction of learning tools on the OLS site limited participation. Participation on the tutorial would have been better if the Internet access to the OLS site was good. Persons who could only access the OLS site from their places of employment participated less on the tutorial.

Another reason for the low level of participation on the tutorial was the limited knowledge and skills that most participants had of the course content that was taught. Most participants had limited digitization and metadata indexing work experience.

5.2 Internet access issues
Poor Internet access hindered the use of the online tutorial. The poor Internet access experienced on the tutorial is a common occurrence in South Africa and other developing societies. Wolff and MacKinnon (2002) indicate that:

> As the number of connected computers grows in developed countries, there is not similar growth in developing countries, which increases the divide between the haves and the have-nots.

Internet connectivity in South Africa at the time when the tutorial was hosted was not efficient as other countries in the world. There are signs that Internet access in South Africa may improve in the near future (Mutala, 2008) and this will undoubtedly assist future online tutorials.

The access to the OLS site was poor. There were many periods of downtime on the OLS site. This was compounded by the limited online technical support for the OLS site. The facilitator of the tutorial had to contact a staff member from ITD whenever the OLS site was not accessible. Participants on the tutorial, furthermore, did not have direct access to this online support.

Given the above facts, the research was not able to test whether the design of the tutorial according to constructivist teaching principles did promote communication and interaction amongst participants and did improve the transfer of knowledge and skills on the tutorial. While the tutorial was designed with constructivist teaching principles in mind, the less than anticipated number of participants and the various problems associated with connectivity did not allow constructivist learning to occur.

The research also had to ascertain whether metadata indexing and digitization skills were taught on the online tutorial. To this end the second research question read as follows:

- *Is the online tutorial a teaching instrument capable of teaching metadata indexing and digitization skills?*

There is sufficient evidence from this investigation to show that metadata indexing and digitization skills were taught on the online tutorial. The evidence is that participants did submit scanned images and metadata records for the digitization and metadata exercises. However the amount of work submitted by the majority of the participants was low. For the digitization tasks only three participants submitted the required ten scans. Three other participants did not submit any scans at all for the digitization exercise. For the metadata creation task one person created the required ten records whilst three persons did not do the exercise. Digitization and metadata indexing skills were new to the participants so although the submission of work was low the fact that participants were introduced to these new skills and knowledge and did submit work for the tasks indicates that the online tutorial was capable of teaching metadata indexing and digitization skills.

In addition to the above "evidence", the participants also stated (in response to a question on the post-course questionnaire) that they did learn digitization and metadata indexing skills on the tutorial. On the post-course questionnaire the majority of the participants stated that they were able to learn these skills on the online tutorial. Furthermore, the majority of the participants stated that they did not have difficulties understanding digitization and metadata indexing concepts in the tutorial. Finally, these participants were of the opinion that they understood the technical requirements for digitization and metadata indexing for each task. It is acknowledged by the researcher that these are self-reported assessments and that some form of follow-up testing would be required to confirm whether these skills had been gained or not.

Most of the participants did not have a fundamental or basic knowledge of metadata indexing and digitization. Therefore they took longer to complete tasks. One student stated that he had problems understanding instructions on the metadata indexing exercise. Another student stated that he had problems at first but was able to complete tasks when he had assistance from the facilitator. The students' problems with interpreting the instructions and understanding the subject content on the tutorial could have been overcome if more students were able to use the communication tools to ask for explanations and assistance from the facilitator.

It was important to obtain the participants' ratings and opinions of the training they received on the online tutorial. Therefore the third research question read as follows:

- *Is the online tutorial an effective teaching tool?*

The results show that the tutorial was at certain times an effective teaching tool. However, as discussed above (and below) there were issues that disrupted the functioning of the tutorial and limited its effectiveness as a teaching tool. The results show that there

are limitations to online learning if the learning environment is not supported by the necessary technology, secure Internet access and participation of learners.

Participants require a certain level of computer skills to enable them to participate in an online learning course that teaches computer-based subjects. Therefore an assessment of participants' computer skills in relation to how they affected their participation on the online tutorial was needed.

5.3 Computer skills of participants

Participants were asked whether they did not complete any tasks because they did not possess the required computer skills to complete the task. This question was asked to ascertain if participants' lack of computer skills hindered their learning on the tutorial. Most participants stated that they had sufficient computer skills to complete tasks. However, some participants did have problems trying to understand some of the technical instructions, for example, some of the scanning processes and instructions for the metadata indexing exercise.

To participate on the tutorial participants required access to the necessary computer hardware and software. Therefore an assessment of this access was needed.

5.4 Access to computer hardware and software

Seventy percent of the participants stated that they had access to the necessary computer hardware and software. This is misleading because many participants experienced problems gaining access to scanners. The scanners were not always freely available at the institutions they worked at. This is because digitization was not a common feature of the libraries where the participants were located during the running of the tutorial.

Gaining access to the metadata generator was listed as a computer hardware access problem. This tool was hosted by the DISA Project on their website. The reasons for the access problem to this resource were:

- The server that hosted the metadata generator crashed often and had to be rebooted by a DISA technician; and
- The metadata generator could not be accessed by participants at some non-UKZN Institutions.

Participants also had problems uploading image files to the OLS site. The image files were too big for the submission tool on the OLS to handle. Participants were asked to use their personal email to post files directly to the facilitator.

These computer hardware and software problems made participation on the tutorial difficult. Most participants encountered poor access to these resources at the institutions where they were located. Access to the necessary computer hardware and software needed to be easily accessible for participation on the tutorial.

A disappointing aspect of the tutorial was that some exercises on the tutorial were not completed by some of the participants. This is discussed below.

5.5 Participants who did not complete some of the exercises
Some participants were unable to do some of the exercises on the tutorial. The reasons given for not completing exercises ranged from work commitments, problems encountered with OLS, no access to the hardware required (that is, a scanner) and no Internet access at home to do the tasks.

Some tasks in the exercises were not completed because participants did not possess the skills required to complete these tasks.

5.6 The design of the tutorial
The tutorial was originally designed to be hosted over a period of three weeks. This was extended to six weeks because of the problems participants encountered with the tutorial. Participants found it difficult to complete tasks in allotted times.

Some participants felt that the tutorial should have been designed for a more specific learner group. They felt that the content on the course was too advanced for participants who had no digitization or metadata indexing experience. The suggestion was that the tutorial should be designed either as an introductory tutorial (which would necessitate some redesign – see below) or as a more advanced course to teach students who have had some experience in digitization and metadata indexing.

A "simpler" digitization and metadata indexing course could have been designed. However, the course content for this tutorial had to be designed according to DISA metadata and digitization standards. The DISA standard could therefore be considered difficult for participants who have limited or no experience in the two subject areas. The choice on whether to develop an introductory or advanced courses is dependent on the needs of the particular digitization project for which the tutorial is being developed.

The design of the learning tools also attracted some criticism. A student stated that some of the learning tools and the subject content on the tutorial were complex and difficult to understand. The subject content on the tutorial was new to most of the participants. The instructions required participants to carry out tasks that involved the technical aspects of metadata indexing and digitization.

To address this problem the researcher made changes to the instructions given on the tutorial, whilst the course was being run based on difficulties students had in interpreting some of the instructions. Some of the learning tools on the tutorial also did not work efficiently and this had to be corrected by the researcher contacting the ITD staff at UKZN.

Just over half (50%) of participants rated the online learning experience favourably based on their experience on this tutorial. The tutorial was rated fair by 10 percent (or one) of the participant.

Participants gave further comments on the tutorial. Advice and criticism was given which will be used to improve the capabilities and effectiveness of future online tutorials.

Suggestions made by individual students and comment by the researcher were:

- "The tutorial should be tested on a more formal student group."
  This suggestion has merit in that a more focused formal student group will have an obligation to participate on the tutorial and submit the required work. The problems that students encounter on the tutorial would be dealt with within the formal student group setting. This would foster sharing of knowledge and information within a group setting.

- "Have a flow to the structure of the instructions on the tutorial. Give short introductions of new concepts including quotations of third party material (hyper linking to relevant sections)".
  This advice can be used when further development of this tutorial takes place.

- "If you go into the DC Generator, you don't have the object/interview available in the browser anymore that you are supposed to describe. I therefore had to open the interview in a different window to have it available."

- "The interface should inform users to type a first letter to get a controlled vocabulary suggestion".
  The two comments above were conveyed to the digital technician of the DISA Project who is responsible for the maintenance of the Dublin Core metadata generator.

- "For absolute beginners online training of "digitization" and "metadata" does not work, only real world training in a real classroom with a scanner, PCs, a trainer etc".
  Online training for digitization and metadata indexing has been conducted at various levels and has been designed for beginners and for individuals with advanced skills. A number of tutorials for both beginners and advanced learners exist on the Internet. The research cannot accept this opinion as indisputable.

The results indicate that some of the learning objectives were achieved but with limitations, and that the tutorial did teach digitization and metadata indexing skills and at times was an effective teaching instrument. It is clear from the results that the attempt to enhance the learning experience by creating a constructivist learning environment could not be achieved.

The research had to deal with the challenge of hosting the online tutorial for participants who were all librarians and were all employed full-time. The exercises that were given on the tutorial required regular participation on the tutorial in order to complete the exercises given. The tasks were new to most participants and often took long to complete. Due to their work commitments participants had limited time to dedicate to completing these

tasks. This situation was exacerbated when participants attempted to access the OLS. They were confronted with the challenges of poor Internet access to the OLS site and learning tools on the OLS site that malfunctioned.

In the study, the first hurdle to implementing constructivist learning principles on the online tutorial was the limited use of the communication tools hosted on the tutorial by the participants. This was due mainly to the fact that some participants on the tutorial did not have Internet access at home. They were only able to access the OLS site at their place of employment. This lack of Internet access to the OLS site contributed to poor participation. Paul (2002) asserts that students facing these challenges are likely to become uninterested in learning.

> Education and training must create a need for students to experience ICT; otherwise ICT on its own will not result in increased participation rates, especially from individuals coming from undeveloped and underdeveloped areas (Paul 2002).

According to Paul (2002), if media such as the Internet have no functional relevance for individuals, they will either cease to use it or use it as a pastime.

Another reason for poor participation on the online tutorial was that it was conducted in a country that contends with the negative impact of the digital divide. The question is how non-participation should be dealt with in developing countries. Mashile and Thomas (2003) state that there is a dilemma on how to deal with non-participation on an online tutorial in countries affected by the digital divide:

> The immediate response to non-participation in the collaborative online course was to suggest that no choice should be provided in future, which will force all students in the program to study at least one module entirely online. However should we really force students in a developing country to study online?

The second hurdle to implementing constructivist learning principles on the online tutorial was the Internet access problems that affected the functioning of the tutorial. Poor Internet access and access to other computer technologies is an issue that confronts South Africa and other developing countries.

One major feature of the digital divide in a developing country refers to "the unequal and disproportionate pace of development in societies in having access to digital infrastructure and services" (Paul 2002). Individuals without access to ICT are often those with a low socio-economic status, characterized by poverty, unemployment, geographic isolation, and the like. This imbalance was also evident within the tutorial learner group. Some of the participants had Internet access at their homes and therefore they were able to participate in the tutorial from their households. The other participants' could only access the tutorial at their places of employment.

Although online learning offers new technologies that can benefit education and training in developing countries Wilkinson, Wilkinson and Nel (2001) point out that the

developing world still has to deal with some issues that place limits on the use of online learning.

> Like many other developing countries, South Africa is facing the challenge of harnessing information and communication technologies effectively in order to accelerate social development. The debate in this area centers on the extent to which the adoption and use of these technologies can contribute to the reduction of the massive inequity that exists among and within societies.

Some participants who made use of an ISP (Internet Service Provider) to access the tutorial from off campus experienced difficulties with their Internet connection to the online tutorial. Recent developments in South Africa indicate that Internet connectivity will improve. The laying of an undersea Internet cable has taken place on the East coast of South Africa in 2009 is one example of signs of improvement.

> The Seacom undersea cable, commissioned by new market entrant Neotel, will increase South Africa's international bandwidth 40-fold, and will mark the beginning of a seismic shift in the Internet landscape in Africa. It is only one of a series of new cables which will make the connectivity landscape completely unrecognizable for both South Africa and the rest of the continent by 2013 (Internet turnaround has begun in SA, 2009).

Improved Internet access will assist the implementation of an online digitization and metadata indexing tutorial in South Africa and contribute to greater participation on the tutorial.

5.7 The shortcomings of OLS

The shortcomings of OLS, the online learning environment that hosted the online tutorial, were as follows. OLS needed to be more efficient. There were parts of the OLS system that did not function efficiently. The technical support for OLS was limited, access to the OLS site was poor and the OLS server crashed many times during the course. Whilst OLS has been used as the online learning environment at UKZN the viability of the OLS system in the South African environment has been questioned. Van Greunen and Wesson, (2005) indicate that limited research has been conducted on the design of the OLS:

> Despite the fact that many such design guidelines exists there is no evidence as to whether these have been used in practice in South Africa. In addition, the usability of locally developed WBL tools, such as KEWL and OLS, has not been widely researched in South Africa.

During the middle of 2009, UKZN, in order to keep up with the latest technological and educational trends, decided, to phase out the use of OLS as their online learning system. Some of the shortcomings identified in an online survey conducted on OLS were insufficient support and a lack of development of learning tools (Jackson, 2008).

> Though support is available, and support staffs are knowledgeable enough to sustain

the current reasonably stable system, it is limited in terms of being able to provide ongoing presentations, workshops and training to course facilitators. Where there is a complete lack, is in the provision for the future development of the OLS in keeping up with new technological and educational trends.

MOODLE (Modular Object-Oriented Dynamic Learning Environment) a free open-source e-learning software platform, was chosen to replace OLS as the online learning environment system for UKZN. MOODLE had already been operating as an online learning system in one or two faculties at UKZN.

This discussion looked at the factors responsible for the successes and shortcomings of the research. The discussion indicated that some of the learning objectives were achieved but mostly with limitations on their success. The reasons why some of the goals of the research were not achieved were investigated in the discussion. The significant factors that influenced the running of the tutorial and the subsequent results of the research were noted. The discussion also focused on participants' reactions to parts of the learning process that were found in the research results.

Chapter 6 - Conclusion and recommendations

6.1 Introduction
In this chapter a summary of the study is given, significant findings have been outlined, conclusions and recommendation are made and suggestions for further research are given.

The aim of this research was to ascertain whether the DISA metadata indexing and digitization online learning tutorial that was developed could be used to effectively teach metadata indexing and digitization skills using constructivist teaching principles.

The research attempted to answer the following questions:

- Does the use of constructivist teaching elements in the tutorial design allow for a more effective communication of knowledge and skills?
- Is the online tutorial a teaching instrument capable of teaching metadata indexing and digitization skills?
- Is the online tutorial an effective teaching tool?

6.2 Summary of the study
Chapter 1 provided a background to the study. It investigated the growth of the Internet and computer technologies worldwide and the impact that this has had on the library and archival professions. The purpose of the study and the key research questions that needed to be asked were then outlined. The other significant issues that would inform the study were then discussed. These included digital libraries, digital librarian training, the DISA Project, metadata indexing, digitization and web-based learning. The limitations of the study were provided and a breakdown of each chapter of the study was then given.

Chapter 2 reviewed the relevant literature related to the research problem. The review identified literature relating to online learning, metadata indexing, digitization and the implementation of constructivist teaching principles in an online learning environment. Literature relating to digitization and metadata indexing training conducted by the DISA Project and other organizations was also reviewed.

Chapter 3 described the research methodology used. It consisted of three phases:
- Phase 1 – Development of the tutorial
- Phase 2 - Implementation of the tutorial; and
- Phase 3 – Evaluation of the tutorial.

The evaluation was comprised of:

A qualitative evaluation of email correspondence and the discussion forum hosted on the tutorial.

A quantitative evaluation of the post-course questionnaire completed by participants on completion of the tutorial.

The population consisted of a group of 10 professional librarians. Nine members of this group worked at library and archival institutions in KwaZulu-Natal whilst a single overseas participant worked as a project coordinator for an international library digitization project.

Chapter 4 provided the data analysis and presentation of results. The data analysis consisted of:
- A qualitative analysis of email correspondence between the participants on the tutorial and the facilitator.
- A qualitative analysis of the discussion forum hosted on the tutorial.
- A qualitative and quantitative analysis of a post course questionnaire.

The research questions as outlined above provided the basis for the presentation of results.

Chapter 5 consisted of the discussion of results. Unexpected and unsatisfactory results were explained. Important elements that influenced the outcome of the results were discussed.

6.3 Significant findings

The results that were obtained from the research indicate that the online tutorial did teach metadata indexing and digitization skills. This is supported by the responses received from participants in the post-course questionnaire and the evidence of the work that was submitted on the tutorial.

The significant question is how effective was the online tutorial in conducting the teaching of these skills. The tutorial could be considered effective because it was able to teach metadata indexing and digitization skills to participants on the tutorial. However the effectiveness of the training was limited by the factors which hindered the tutorial (and which have been outlined in the results and the discussion of results in the preceding chapters).

The goal of achieving a collaborative constructivist learning experience on the tutorial had to a large extent not been achieved. A number of factors contributed to the failure to achieve this goal. To implement the online learning tutorial using constructivist teaching principles requires various factors to be in place. In particular, the online learning tutorial requires a technologically efficient online learning environment. It also requires learners to be committed to participation on the tutorial. Neither of these conditions was in place and this made the implementation of an online tutorial based on constructivist learning principles difficult.

6.4 Evaluation and recommendations

The learning tools on the online tutorial need to work more efficiently. This would require technical support to be installed for online learning to assist when tools on the learning system malfunction. The installation of the necessary technical support will increase the probability of a successful online learning tutorial.

Participants must also have access to the required computer hardware and software that is needed to participate on the tutorial. Importantly it is essential that participants have access to scanners and the online metadata indexing creation tools. (Participants on the tutorial did not have easy access to both these tools). These are the tools that are required to complete the digitization and metadata indexing tasks respectively.

Another factor that hindered the effectiveness of the tutorial was the unfamiliarity of some of the participants with the concepts of digitization and metadata indexing and online training. The designers of online tutorials teaching digitization and metadata indexing skills to South African learners should be aware that these programs are likely to be used by persons from deprived learning backgrounds. Van Greunen and Wesson (2005) affirm that online learning programs in South Africa should cater for students from deprived learning backgrounds.

> Students at South African universities come from educationally, linguistically and culturally diverse backgrounds. Many of these undergraduate students are introduced to computers for the first time at university, and for the majority English is a second or even third language. More research is needed in South Africa to determine how to design flexible WBL (web based learning) environments that can accommodate a wide range of users.

Prospective participants in the tutorial should preferably have a basic understanding of digitization and metadata indexing concepts prior to enrolment. It would be an advantage if participants were engaged in metadata indexing and digitization in their current work. This would allow participants to be familiar with the technologies and terms that are used in the instructions of the tutorial.

Participation on the online learning environment needs to be increased. Solutions have to be found for this. One solution that can be considered would be to ask participants to provide an undertaking before the start of the tutorial that they would be available for participation on the tutorial. Participants should confirm that they would be able to access the OLS site daily to complete tasks and to allocate two hours for participation on the days that chat rooms and discussion forums are scheduled.

Solutions for the design of the digitization and metadata indexing online tutorial have to be found in response to the problems students identified with some aspects of the design of the tutorial. The design has to be less complex. Some participants stated that they found the design of some parts of the online tutorial too complex to understand. There were suggestions that the tutorial should be designed for students with a specific level of digitization and metadata indexing skill, that is, beginner or advanced. The course content for the DISA tutorial was designed according to DISA metadata and digitization standards. If required this tutorial can be designed for advanced learners. The design of the tutorial is dependent on the learning needs of the particular digitization project for which the tutorial is being developed. This would determine whether the tutorial is designed for beginners or advanced learners.

As indicated the online tutorial did have some successes. It taught metadata indexing and digitization skills to some participants. Some of the participants stated that this was the first training they had received in these two subjects. Participants also stated that they understood the concepts taught and submitted scans and metadata records for the tasks, and were able to apply the skills that they learnt on the tutorial in their daily work.

The results of the study indicated the problem areas that have to be focused on and improved to create more effective training on the tutorial. The research did gain useful lessons about designing an online tutorial according to constructivist principles despite a vibrant constructivist learning environment not being present on this tutorial. The research found that in order to create a functional constructivist learning environment the necessary technological and administrative support and the commitment of participants to participate on the tutorial is required.

The DISA online tutorial should still be developed further. The findings of this research can be used to develop the DISA tutorial into a better teaching instrument. The following in particular, must be taken into consideration:

The learning tools hosted in the learning environment have to work efficiently. Internet access to the online tutorial at all times would have to improve. The online learning environment also has to have sufficient technical support to handle technical problems on the tutorial. Participants should have sufficient time to be able to participate in online chat rooms and discussion forums and complete tasks for the exercises given. The required computer technologies and technical support that are needed to conduct the digitization and metadata indexing tasks must be provided.

Training in metadata indexing and digitization online will become part of the training of future librarians and archivists. Current evidence indicates that there is always going to be a need for metadata and digitization training for modern library and archival institutions. As El-Sherbini and Klim (2004) note:

> As scholars, researchers and other users continue to increasingly rely on information that is available via the Internet, standardized metadata schemes become an essential element in the information retrieval process

The increasing rate of technological development and the growth of online training lays more emphasis on the need for online digitization and metadata indexing training for libraries and archives in South Africa.

Library and archives in South Africa are now increasingly using Internet technologies to create web-based information resources. This has created a need for librarians and archivists with digitization and metadata indexing skills to manage and administer these resources. Library training institutions in South Africa need to include online training programs to teach digitization and metadata indexing within their curriculum.

Library and information science and computer technology schools in African countries should be seen as the key to imparting skills and knowledge on digital library projects. Considering the increasing demand for librarians with skills needed to initiate, manage and participate in digital library projects, there is a need to integrate digital library issues into the LIS curricula in African library science and information science programmes (Chiware, 2007).

It is evident that online training in digitization and metadata needs to be developed further in Africa and South Africa. There are opportunities for library institutions and online digitization projects in South Africa to develop digitization and metadata indexing online training programs. While problems can be encountered (as this study has shown) in the implementation of this training it is imperative that this training is developed because there is a desperate need for these skills in libraries and archives in Africa and South Africa.

The growth in the number of online digital repositories and the increasing digitization of library and archival materials in South Africa also warrants more research to be conducted into online learning and digitization and metadata indexing. The findings of this study can be seen as a contribution to our understanding of the teaching of metadata indexing and digitization skills online and as a contribution to the research on these subjects by the library and archival profession in South Africa.

In light of the results of the study and the conclusions made the following are suggestions for further research:

The DISA online tutorial as developed and used for this study can be developed and tested further. The findings from this research can be used to further upgrade the DISA tutorial. This research should aim to develop a new online tutorial that will operate within a technically efficient online learning environment that has tools and supporting structures that function efficiently. This tutorial should also be supported by participants who are willing to dedicate sufficient time to complete tasks given and are willing to participate regularly on discussion forums and chat rooms.

At a broader level it is suggested that an investigation be conducted into the use of online learning as a strategy to train librarians and archivists in the South African context. Online learning is a new strategy that has been used to a limited extent to train librarians and archivists. The growth in the number of web-based learning technologies now require that these information professionals make greater use of these tools for their own growth and development. The research should investigate ways online training can be used more widely to train future librarians and archivists in some aspects of library and archival science.

Further research could be conducted on finding new strategies to implement constructivist teaching principles in this training by using a different approach to tutorial design. The course redesign should focus on making it easier for participants to use learning tools, and to communicate and share knowledge with other learners. The course should consist of six three-day modules for each of the exercises with a two-day break

between each course. This would make it possible to accommodate this training into work schedules and other commitments participants might have. The course should preferably be hosted on a local area computer network to which all participants would be connected. This would improve interaction and communication amongst participants, as well as participants' ability to access the online tutorial and to be able to use the online learning tools. This proposed research will look at developing other strategies to enable the implementation of constructivist teaching principles.

This chapter showed how the research problem was defined and the significant questions that this research asked. The description of the various parts of this research was then summarised by chapter. The findings of this research in response to significant questions that were asked indicated that:

- Metadata indexing and digitization skills were to a limited extent taught on the tutorial.
- Teaching on the tutorial was considered effective despite the fact that there were factors that hindered teaching.
- A constructivist learning experience was to as large extent not achieved due to the factors that were outlined in the research.

The evaluation of the tutorial looked at problems that were encountered with the hosting of the tutorial and proposed solutions for them. The evaluation indicated that the online tutorial has the potential to be a more effective teaching tool. To achieve this it requires the necessary technological and administrative resources and commitments from participants to participate on the tutorial.

The recommendations for future research indicates that benefits will accrue to libraries and archives if further research and development is conducted into online training in metadata indexing and digitization. The outcomes of further research and development would result in the creation of more efficient online metadata indexing and digitization training tutorials and the growth of a greater body of knowledge for this new area of research.

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Questionnaire

Dear Participant

I am sending the questionnaire to obtain your assessment - both positive and negative – on the online tutorial you participated in. The questionnaire will also provide data on the process of conducting metadata indexing and digitization training in an online environment.

The questionnaire will concentrate on 4 aspects of the tutorial:

- Internet access issues related to the tutorial
- The level of participation by students on the tutorial
- Usability of the tutorial
- The learning experiences gained on the tutorial

Please complete the questionnaire and email it back to me at moodleysu@ukzn.ac.za. Many thanks; your participation is much appreciated.

1- Internet access issues

1 - Did you have any problems accessing the Internet whilst completing the tutorial?

Yes	No

If yes, please describe these.

2 - Did you access the site using the University of KwaZulu-Natal network?

Yes	No

If no, what type of Internet access did you have?

ADSL	Dial up	LAN network at work	Other

3 - Were there any other factors that hindered your access to the site?

If so, please list these.

```
[                                                                    ]
[                                                                    ]
[                                                                    ]
```

2 - The level of participation by students on the tutorial

1 - Some students did not participate in some parts of the tutorial.

Does this apply to you?

Yes	No

If yes, what reasons would you attribute for your lack of participation?

```
[                                                                    ]
[                                                                    ]
[                                                                    ]
```

2 - Did the tutorial interfere with your work schedule?

Yes	No

Did you have sufficient time to participate in the tutorial?

Yes	No

3 - Were their any tasks that you did not complete because you lacked the computer skills required to complete the task?

Yes	No

If yes, please note the computer skills you lacked.

```
[                                                                    ]
[                                                                    ]
[                                                                    ]
```

4 - Did you have access to the required computer hardware (scanners) and computer software needed to complete the digitization and metadata indexing exercises?

Yes	No

If no, please list the computer hardware or software you did not have access to?

5 - Did you use the discussion forum in the online tutorial?

Yes	No

If no, please list the reasons you did not use the discussion forum.

3 - Usability of the tutorial

1 - Did the learning tools, the subject content and the design of the tutorial assist the learning process?

Yes	No

Please elaborate.

2 - Were you able to understand the technical requirements for digitization and metadata indexing for each task?

Yes	No

If no, please note any specific problems you encountered.

```




```

3 - Was the OLS system easy to use?

Yes	No

If no, please describe any problems that you experienced.

```




```

4 - Were any of the digitization and metadata indexing concepts in the tutorial difficult to understand?

Yes	No

Please elaborate.

```




```

4 - Learning experience gained on the tutorial

1 - How many scans did you create?
_____

2 - How many metadata records did you create?

_____

3 - Were you unable to do any of the exercises?

Yes	No

If you were unable to do the exercises, what were the reasons for this?

```



```

4 - Did you learn digitization skills on the tutorial?

Yes	No

5 - Did you learn metadata indexing skills on the tutorial?

Yes	No

6 - Please rate the tutorial as a medium to teach digitization and metadata indexing.

Excellent	Good	Average	Fair	Weak

7 - Please rate online learning based on your experience on this tutorial.

Excellent	Good	Average	Fair	Weak

8 - Should you have any other comments to make concerning your experience on this tutorial please note them below.

```



```

Once again, thank you for completing this questionnaire.

Screenshots of the DISA online tutorial

Screenshot 1

Introduction to the tutorial

Screenshot 2

Discussion Forum

Screenshot 3

Digitization Introduction

Screenshot 4

Digitization exercises

Scanning exercise 1: Scanning different graphic formats and file sizes

Screenshot 5

Scanning exercise 1 : Scans submitted
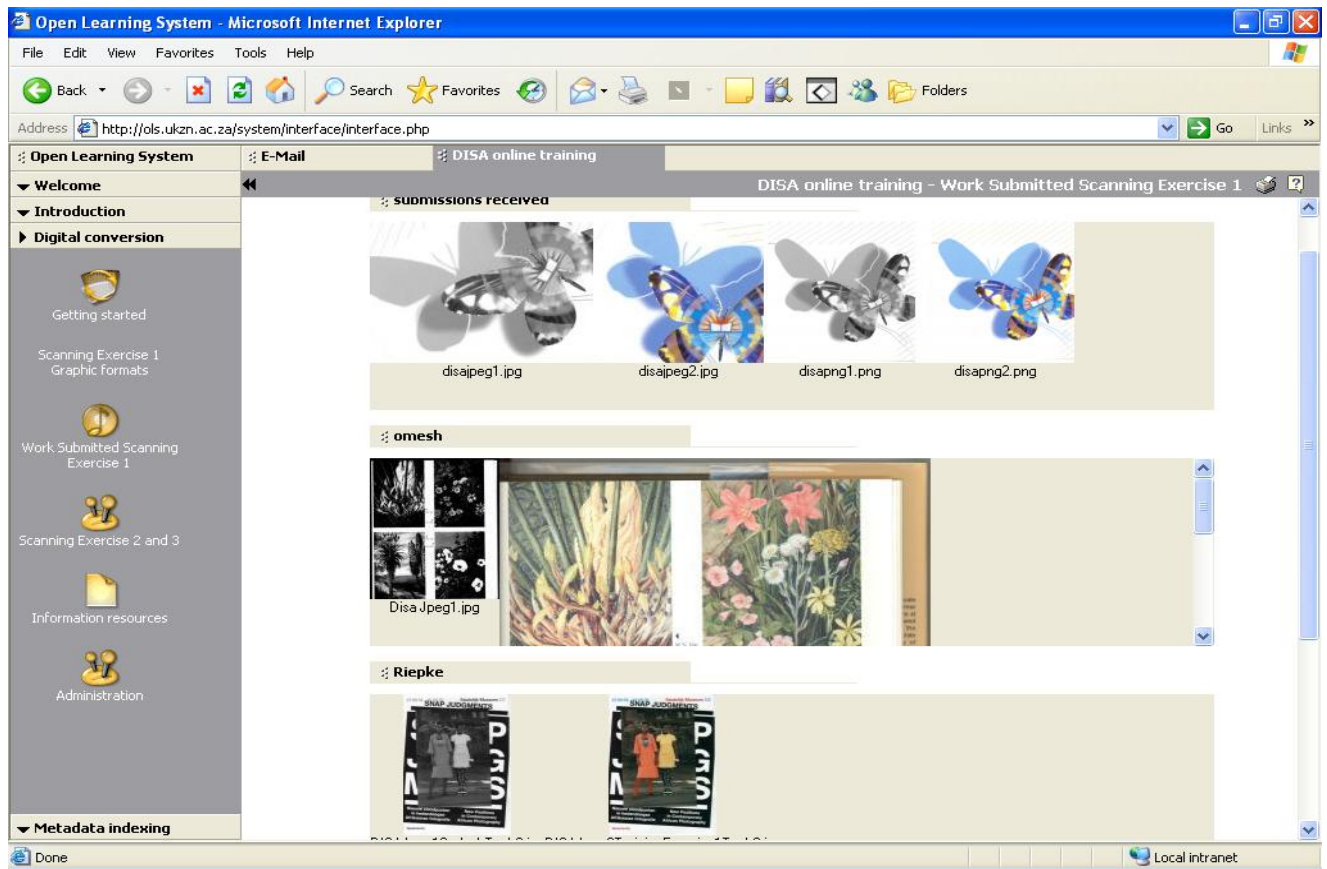
Screenshot 6

Scanning exercise 2: Cleaning scans

Screenshot 7

Scanning exercise 2 : cleaned scans submitted

Screenshot 8

Metadata Section : Introduction

Screenshot 9

**Metadata indexing exercise**

Dublin Core Creation

Screenshot 10

Metadata generator used to create Dublin Core records