Information literacy skills of postgraduate students in the Faculty of Engineering at the Durban University of Technology

By

Mousin Omarsaib

BA Hons (Information Science)
UNISA

Submitted in partial fulfilment of the requirements for the Degree of Master of Information Studies (MIS) in the Information Studies Programme, School of Social Sciences, College of Humanities, University of KwaZulu-Natal, Pietermaritzburg

Supervisor: Mr Athol Leach

2015

Declaration

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2. This thesis has not been submitted for any degree or examination at any other university.

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Dedicated to my parents

Abstract

This study examined the information literacy skills of the postgraduate engineering students at the Durban University of Technology (DUT). The rapid growth of the information age and the advent of the information explosion simultaneously with the Internet has created a problem for many novice and expert researchers when accessing quality information resources for research. There are students filtering into graduate research programmes in higher education institutions across South Africa who possess few information literacy skills. Although this problem is partially rectified at undergraduate level it is apparent, based on the researchers observations that many graduate students enter into research programmes lacking in information literacy skills.

The aim of this study was to investigate the information literacy skills of the postgraduate engineering students at the DUT and to make recommendations to improve the information literacy skills of these students. The objectives of this study were therefore to ascertain the types of information literacy skills postgraduate engineering students brought from their undergraduate studies at the DUT, the major challenges postgraduate engineering students experienced in learning and applying information literacy skills and the ways in which the information literacy skills of postgraduate engineering students can be improved at the DUT. The conceptual framework of this study is based on the understanding of information literacy from the Association of College and Research Libraries Information Literacy Competency Standards for Higher Education.

The two population sets for the study were the DUT postgraduate engineering students and the postgraduate librarians. Self-administered questionnaires were distributed to the postgraduate engineering students of which thirty were completed giving a response rate of 38%. The two postgraduate librarians who were involved in teaching information literacy to the postgraduate engineering students were interviewed using a semi-structured interview.

The findings of this study revealed that the postgraduate engineering students at the DUT are lacking in key areas of information literacy, namely, analysing a topic, forming a search strategy, using boolean operators, database searching, understanding referencing and plagiarism. Recommendations included the need for embedding information literacy instruction within the curriculum making it credit bearing and partnering between university administrators, academics and librarians are crucial to enhance information literacy. Suggestions for further research were provided.

Acknowledgements

I express my sincere gratitude to GOD, the ALMIGHTY WHO bestowed me with the moral, intellectual and spiritual strength to undertake this research with the guidance of my spiritual mentor. I dedicate this work to my parents Farouk, Mohamed, Asma and Munira. I will always be eternally grateful for their support throughout my journey in life. They have shown their dedication, commitment and love to me, creating an environment that nurtured me to become the individual I am today.

This dissertation would not have been completed without the support of my family, work colleagues and especially my academic supervisor, Mr Athol Leach. I would like to express my appreciation to him for his guidance and supervision. His direction has been instrumental throughout the process of my research and during the writing of this dissertation.

Thank you to the DUT postgraduate librarians, Avenal and Sarah who participated in this study. Your input was important for the completion of this research. To Anisa, Nhlanhla, Segarani, Kogie and Nontutuzelo your support and assistance is appreciated.

Lastly I would like to express my love to my wife Anisa, my children, Aminah and Humza. I hope that this study inspires you and our children to be spirited in all aspects of your lives. You were my inspiration, motivation and the reason for my perseverance throughout the duration of my research.

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List of acronyms and abbreviations

ACRL: Association of College and Research Libraries

ALA: American Library Association

ANZIL: Australian and New Zealand Institute of Information Literacy

CILIP: Chartered Institute of Library and Information Professionals

DUT: Durban University of Technology

ICT: Information and communication technology/ies

OPAC: Online public access catalogue

SCONUL: Society of College, National and University Libraries

SPSS: Statistical Package for the Social Sciences

Chapter one: Introduction

1.1 Introduction

One of the key characteristics of the 21st century is the challenge the information explosion has for society, globally. Global communities notwithstanding their literacy levels have access to a wealth of information through various formats and technologies. However, at the turn of the century, because of its rapid growth and accessibility, the primary source of seamless access to information through various technologies has been the Internet. According to Gbaje (2007) the online environment particularly the World Wide Web, is an unstructured one and the advancement in technology has made it possible for anyone with the necessary technology and skills to post anything on the Internet without independent review and evaluation resulting in unreliable information on the Internet.

The rapid growth of the information age and the advent of the information explosion simultaneously with the Internet has therefore created a problem for many novice and expert researchers when accessing quality information resources. Access to information is one aspect but being able to find credible information sources, use information responsibly, critically and objectively are vital in creating an individual who can make informed decisions in their daily lives.

Fundamental to individuals using information responsibly, critically and objectively is the term information literacy. Interest in information literacy began in the 1980s but the subsequent emphasis on information literacy occurred in the 1990's due to the information explosion (Ojedokun 2007). Information literacy gained momentum in the 1990's and became a concept that was being addressed mainly by higher education libraries. However, as explained by Bundy (2002) that while information literacy is an issue that is and needs to be consistently promoted by higher education libraries to improve information skills, it is not exclusively a library issue but a global one that needs to be addressed by the global society.

Bundy (2002:3) affirms that in a world so dominated by information needs, issues and considerations, acceptance that information literacy is required for a person to function effectively as an individual in an increasingly global society seems axiomatic. This means that as early as the childhood stages of a learner's educational development the

responsibility of information literacy should be apparent. It is therefore a lifelong learning experience which should be addressed not only by higher education institutions.

Gross and Latham (2007: 2), elaborate that it is crucial to effectively integrate information literacy skills education into every stage of an individual's development if we want learners to be participants in tomorrow's workforce. Learners need to achieve a level of information literacy that will allow them to find, assess, and use information critically in order to succeed in society. Feast (2003: 81), observes that the need for tertiary graduates to acquire and develop information literacy skills has been emphasised in recent years in a world where many analysts believe access to information is not only important for survival but the key to prosperity. Higher education libraries are therefore active role players in building an information literate society thereby creating a lifelong learner.

The dilemma facing higher education institutions in South Africa, however, from the researcher's observations is the lack of information literacy skills post matric student have from their secondary level of education. This gap is apparent when subject librarians engage with first year students. This problem persists at undergraduate levels although an emphasis is placed on information literacy, again based on the researcher's observations and interactions resulting in many students filtering through into postgraduate programmes lacking in critical information literacy skills. Therefore, although postgraduate librarians are involved in information literacy training it is important to understand the information literacy skills of postgraduate students prior to their training initiatives. The situation is such that postgraduate students entering postgraduate programmes lack in key information literacy skills. This is because within the South African context there is a lack of exposure to information literacy initiatives from early as secondary school continuing into undergraduate programmes and the lack of information literacy skills are seen at postgraduate level within higher education.

Thus for the purpose of this study the focus is on the information literacy skills of postgraduate engineering students at the DUT. The outcome of this study will be based on the findings regarding the information literacy skills of postgraduate engineering students at the DUT and what type of interventions can be recommended to help in closing the gap that exists in information literacy skills at postgraduate level.

1.2 Rationale of the study

At higher education institutions globally the concept of information literacy has become common to the library environment. Information literacy has been implemented and explored by higher education libraries globally for many years. In terms of the international and within the local South African context, undergraduate and postgraduate qualifications depending on the policies of the higher education institution, vary in their emphasis on and importance of information literacy.

Higher education libraries in South Africa have also implemented information literacy programmes at undergraduate and postgraduate levels. The emphasis on information literacy in South Africa is therefore synonymous as within the global context of higher education. However according to Nassimbeni (2000) in South Africa a large number of students in tertiary education lack information literacy skills. The issue of student's understanding and use of information literacy skills therefore needs to be examined within the South African context.

The outcome of this research should help to identify what information literacy skills postgraduate engineering students have when conducting their research. It will also examine the difficulties that students may experience when searching for information. This study will provide recommendations on what needs to be done to further enhance information literacy for engineering students at postgraduate level at the DUT.

1.3 Research problem

The quandary facing higher education institutions in South Africa from the researcher's observations within the DUT is the lack of information literacy skills post matric students have from their secondary level of education. This gap is apparent when subject librarians engage with first year students. This problem persists at undergraduate levels although an emphasis is placed on information literacy. Further, there is an information literacy programme that is provided yet it is not compulsory for students to attend. Students do not realise the importance of these information literacy programmes and attendance is therefore low. The undergraduate information literacy programme at the DUT is structured and marketed to faculties, however, the response from both academics and students is inconclusive.

Information literacy at undergraduate levels at the DUT has been prioritised with the expectation that at postgraduate level, students will be able to access the most appropriate resources and use them ethically and responsibly for their research outcomes. However, many students entering postgraduate studies do so with insufficient information literacy skills.

The researcher has been a subject librarian in the Faculty of Engineering at the DUT for the past four years. It is apparent based on the researcher's observations and interactions during these four years with students at the DUT that many still filter through into postgraduate programmes lacking critical information literacy skills. At this level, postgraduate librarians are involved in information literacy training. However, it is important to understand the information literacy skills of postgraduate students prior to the library training initiatives. The other factor that is evident is the lack of focus on postgraduate information literacy. Whilst there is a three step information literacy programme at the DUT for undergraduate students there is no information literacy programme and approach for postgraduate students.

The researcher therefore investigates into what information literacy skills postgraduate students bring from their undergraduate studies. The researcher also wants to identify the challenges these students face when attempting to apply information literacy skills while conducting research at postgraduate level.

The outcome of this research should be able to identify what the information literacy skills of postgraduate engineering students at the DUT are. On the basis of the findings, recommendations will be made to improve information literacy interventions that are needed to ensure that students entering the postgraduate level of their studies are better equipped with information literacy skills to conduct research. This will also boost the University's standing both nationally and globally, as it will become increasingly important for the DUT library to develop their information literacy programme. It will ensure that postgraduate students have the capabilities to conduct research and thereby contribute to raising the institutional profile by increasing the research throughput rate at the University.

1.4 Aim and key questions to be asked

The aim of this study was to investigate the information literacy skills of postgraduate engineering students within the DUT library. The key research questions which emerged were as follows:

- What information literacy skills do postgraduate engineering students bring from their undergraduate studies at the DUT?
- What are the major challenges postgraduate engineering students experience in learning and applying information literacy skills?
- How can information literacy skills be enhanced amongst postgraduate engineering students?

1.5 Conceptual framework

The conceptual framework of this study is based on the understanding of information literacy from the Association of College and Research Libraries (ACRL), Information Literacy Competency Standards for Higher Education (ACRL 2000). At the time of concluding this study the revised conceptual framework for ACRL was released. However, the preceding ACRL's framework on information literacy in higher education is not uncommon as it became a widely accepted viewpoint globally. This can be supported by Jiyane and Onyancha (2010: 2) who state that while there are many definitions of information literacy none of which is commonly applicable universally. Bundy (2004) further expounds that the principles, standards and practices of the Australian and New Zealand Information Literacy Higher Education Framework has been adapted from the ACRL (2000) information literacy model. The ACRL (2000) model has been adopted and updated to incorporate the trends in information literacy education in higher education in these two countries. This study will also be based on the model as provided by the ACRL's Information Literacy Competency Standards for Higher Education as these competency standards can be implemented to evaluate the information literacy skills of postgraduate engineering students at the DUT. The conceptual framework selected for this study which is based on the Information Literacy Competency Standards for Higher Education and the necessary information literacy skills needed by a student as identified by the ACRL will also be discussed in detail in the next chapter.

1.6 Limitations and Delimitations

The research included only postgraduate engineering students and the postgraduate librarians at the DUT for this study. Due to time constraints, and the nature of a coursework dissertation, not all postgraduate students at the DUT were included in the study. The reason for focusing on the postgraduate librarians in particular and not subject librarians, was due to the fact that postgraduate librarians interact with research students more regularly through various information literacy training initiatives. Postgraduate librarians are therefore expected to be knowledgeable in understanding the information literacy skills of the postgraduate engineering students.

1.7 Definitions of key terms

The following are the key terms used in the study which are briefly defined:

1.7.1 Information literacy

The term is defined as the "set of abilities requiring individuals to recognize when information is needed and have the ability to locate evaluate and use effectively the needed information" (ALA: 1989). A similar understanding of information literacy is assumed by Andretta (2005: 15) who defines information literacy as the ability to identify the need for information; to know the importance of accurate and authentic information; to develop search strategies to assist in finding information; to source information; to evaluate information; and, to use and organise information effectively. The digital environment and technologies such as computers, tablets and mobile devices have also become important factors for successful information literacy skills. Hart and Davids (2010: 30) who conducted research at the Cape Peninsula University of Technology in South Africa specify that as libraries and courses are increasingly digitised, students need to be able to access and navigate online resources successfully. The concept of information literacy will be discussed in more detail in Chapter two.

1.7.2 Lifelong learning

According to Leader (2003: 362), in essence, lifelong learning is an active process, integrating learning into the experience, yet paradoxically entrenched in an agenda of economic and cultural tendencies.

1.7.3 Computer literacy

According to Bundy (2001) and Childers (2003) computer literacy can be understood by being able to efficiently and effectively complete tasks using ICT skills pertaining to the description of the job i.e. personal, work-related and educational requirements. This is further supported by Sayed and de Jager (1997: 6) who state that computer literacy is one of the literacies or skills required in order to be considered as information literate.

1.8 Structure of research

This thesis consists of six chapters. The first chapter provides details regarding the background to the study; the research problem; purpose of the study; the conceptual framework, limitations and delimitations, a brief definitions of terms relevant to the study; an overview of the research methodology used; and, an outline of the research. Chapter two reviews literature relevant to the study. Chapter three discusses the methodology used to carry out the research and Chapter four presents the findings of the study. Chapter five presents discussions of the findings and based on these discussions, in Chapter six conclusions are drawn and recommendations are made. A reference list is included and relevant appendices pertaining to this study are attached.

1.9 Summary

In this introductory chapter, the background to the study, research problem, purpose of the study, research objectives and questions, significance of the study, conceptual framework and finally, a brief definition of terms was discussed. The next chapter reviews the literature available on the topic.

Chapter two: Literature review

2.1 Introduction

A literature review puts a research study into context, by showing how it fits into a particular field (Bertram and Christiansen 2014: 13). Denscombe (2010) refers to a literature review as the first stage to discover what has been done in terms of the topic and to integrate one's views and opinions in understanding the research. This allows the researcher then to decide what has been covered on the topic previously and what tendencies are presently being reconnoitred by others in the field of interest by the researcher. Bless, Higson-Smith and Kagee (2006: 24) highlight the significance of a literature review in creating an awareness of the topic and the current improvements on this issue. Further the literature review can also be seen as the impetus to direct the researcher to the best suited methodology for the topic being researched (Bless, Higson-Smith and Kagee 2006: 25).

According to Marshall and Rossman (2006: 43) the literature review comprises four key components that support the research. These components are:

- firstly, it demonstrates the assumption/s that underpin the research,
- secondly, it demonstrates that the researcher is aware of other research or related research that supports the study,
- thirdly, it shows that the researcher has identified a gap in the existing body of knowledge and that the proposed study will fill that gap; and lastly,
- the literature review assists the researcher in refining and redefining the research objectives and sub-objectives.

This chapter thus presents the literature that was reviewed regarding information literacy and the skills of higher education learners at DUT. It discusses the information literacy skills of learners as they progress into postgraduate programmes. It examines terminologies that are used in related research and generally assists in developing a framework for this research. Through available literature this chapter also examines the information literacy skills of postgraduate students globally and within the local South African context to place this study in perspective. This chapter will also discuss the conceptual framework used for this particular research which is based on the ACRL. Lastly, various conceptual

frameworks were explored in relation to information literacy models applicable to higher education institutions globally and the researcher opines as to why the ACRL model was most suited for this study.

2.2 The concept of information literacy

The concern for information literacy grew out of the potential role of libraries and librarians in education, in both school and tertiary settings. This concern first emerged in the late 1960s, in relation to school settings, alongside early developments in computer-based information technology. However the concept of information literacy was first formally introduced by Paul Zurkowski in 1974 (Andretta 2005: 12).

In the 1970s and 1980s, commonly used terms for information literacy education were library education, library instruction and bibliographic instruction. According to Andretta (2005: 6) these terms referred to the teaching of library instruction that covered information tools such as library catalogues and other library reference sources that helped the user when searching for information. This instruction was teacher-centred whereas the post 1990 emphasis on information literacy is on creating a lifelong independent learner and is therefore a student-centred approach.

Interest in information literacy started in the 1990s and has rapidly grown since then. A significant awareness of information literacy developed at the beginning of the information explosion in the 1990's (Ojedokun 2007) and the concept of information literacy then became more important because of the intensifying pressure of the information age as well as advent of the Internet (Ojedokun 2007).

The development of the concept of information literacy can be traced to the establishment of the ALA Presidential Committee on Information Literacy, whose final report outlined the importance of the concept (ALA 1989). A widely used and accepted definition of information literacy from the ALA's Presidential Committee, states that information literacy is 'a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information'(ALA 1989). However, the term information literacy has been disseminated and restructured to be defined by experts in several ways.

Information literacy has been commonly defined as the ability to identify the need for information; know the importance of accurate and authentic information; develop search strategies to assist in finding information; source information; evaluate information; and use and organise information effectively (Andretta 2005: 15). Martin and Rader (2003) opine that information literacy instruction has always been recognised as teaching an individual about how to access, locate, retrieve and evaluate information which includes electronic formats as well. According to Bruce (2003) information literacy is a basic skill needed in the current environment of rapid technological change. De Jager and Nassimbeni (2003: 108) define an information literate person as "one who can recognise the need for information, access the needed information effectively and efficiently, evaluate information and sources critically, incorporate the selected knowledge into one's own knowledge base, use information effectively to fulfil a goal, use information ethically and, lastly, recognise that lifelong learning and active citizenship require information literacy."

There are thus many definitions of information literacy, none of which, is commonly applicable universally. However, the ALA Presidential Committee provides what has come to be recognised as an all-encompassing definition of an information literate person (Jiyane and Onyancha 2010: 2) and this definition has been given above. Further, information literacy can be accepted as an understanding and set of abilities enabling individuals to recognise when information is needed and have the capacity to locate, evaluate, and use effectively the needed information (Bundy 2004: 3). According to Bundy (2004) the Australian School Library Association's information literacy is described as 'synonymous with knowing how to learn'. This can be supported by Gross and Latham (2007) who state that students need to achieve a level of information literacy that will allow them to find, assess, and use information in order to succeed in school, the workplace, and their personal lives. The ALA reaffirms that information literacy is a means of personal empowerment. It allows people to verify or refute expert opinion and to become independent seekers of truth and objective learners.

According to Moore (2005) while there is general agreement on elements of the definition of information literacy, its practical manifestation is described in a multitude of complementary ways through various information literacy models. This is supported by Woodcock-Reynolds (2011: 4) who agrees that while there is some general agreement over

what information literacy is, practitioners and theorists are not in universal accord over a definition and the implementation process of information literacy. The concept of information literacy has therefore been conceptualised by experts, scholars and librarians as defined within the context of their environment and this has led to the creation of various information literacy models.

2.3 Information literacy models

Globally the characteristics of an information literate person have been primarily described in models set up by the ACRL which is an American based model, the Australian and New Zealand Institute for Information Literacy (ANZIL) which adopted and adapted that of the ACRL, the Eisenberg and Berkowitz Big 6 model and others. These include the Society of College, National and University Libraries (SCONUL), the United Kingdom based information literacy model formulated by the Chartered Institute of Library and Information Professionals (CILIP), Bruce's Seven Faces of Information Literacy model and Doyle's Attributes model. It is important to have a succinct knowledge of some of these models to understand why the researcher has selected the ACRL's Information Literacy model for this study.

2.3.1 Australian and New Zealand Institute of Information Literacy model

ANZIL acknowledge's the provenance of their standards as being adopted and adapted from the ACRL for Australian and New Zealand libraries. In a broader context, information literate people have been described as those who know when they need information, and are then able to identify, locate, evaluate, organise, and effectively use the information to address and help resolve personal, job related, or broader social issues and problems. The model provides the principles, standards and practice that can support information literacy education in all education sectors. This model outlines an information literate individual as one who is able to apply and achieve the following criteria:

• recognise a need for information;

• determine the extent of information needed;

• access information efficiently;

• critically evaluate information and its sources;

• classify, store, manipulate and redraft information collected or generated;

• incorporate selected information into their knowledge base;

• use information effectively to learn, create new knowledge, solve problems and make decisions;

• understand economic, legal, social, political and cultural issues in the use of information;

• access and use information ethically and legally;

• use information and knowledge for participative citizenship and social responsibility;

• experience information literacy as part of independent and lifelong learning (Bundy 2004).

2.3.2 Eisenberg and Berkowitz Big 6 model

Eisenberg and Berkowitz's (1990) model known as the Big 6 designed in the United States is an information problem-solving model that integrates information searching and use skills in a systematic process to access and locate library resources (Lwehabura 2007: 15). The Big 6 model comprises a process that is unified by six logical sequential stages that are applied from task definition to evaluation. The six stages of the Big 6 model are:

• Stage 1: Task definition;

• Stage 2: Information seeking strategies;

• Stage 3: Location and access;

• Stage 4: Use of information;

• Stage 5: Synthesis;

• Stage 6: Evaluation.

While similar to other models the Big 6 approach includes a systematic set of activities. It also provides a broad-based logical set of skills that can be used as a structure for developing a curriculum. It is also used as a framework for distinct problem solving skills (Fisher, Erdelez and McKechnie 2005: 64). The Big 6 model can therefore be implemented

by educators to assess the outcomes of a definitive set of skills that learners should be able to apply with ease for a class exercise, activity or assignment. It is a guide for learners to complete specified tasks. According to Fisher, Erdelez and McKechnie (2005: 65) although the Big 6 model holds potential for the study of human information behaviour, so far most of the research on the Big 6 model has been informal. Other research has shown that the Big 6 model provides a useful framework for teaching technology skills and that teaching these skills in the context of information problem solving results in better retention of knowledge (Eisenberg and Johnson 2002; Eisenberg, Lowe and Spitzer 2004).

2.3.3 Society of College, National and University Libraries model

According to Webber and Johnston (2000: 384) developments in the United Kingdom have tended to lag behind those in Australia and America. SCONUL drew up a framework for the 'seven pillars' of information literacy in 1999 (Webber and Johnston 2000). The framework was created by the authors with the consideration that undergraduates will engage with the model from the bottom pillars whilst postgraduates and researchers will use the higher order pillars for their information needs. The seven pillars comprised the following:

- Pillar one (Identify) - able to identify a personal need for information;

- Pillar two (Scope) - can assess current knowledge and identify gaps;

- Pillar three (Plan) - can construct strategies for locating information and data;

- Pillar four (Gather) - can locate and access the information and data they need;

- Pillar five (Evaluate) - can review the research process and compare and evaluate information and data;

- Pillar Six (Manage) - can organise information professionally and ethically;

- Pillar seven (Present) - can apply the knowledge gained: presenting the results of their research, synthesising new and old information and data to create new knowledge and disseminating it in a variety of ways (Webber and Johnston 2000).

Webber and Johnston (2000) further posit that this staged approach is compatible with Doyle's definition (Doyle 1992) and encompasses topics from the ACRL standards (ACRL 2000). Information literacy has been viewed as important to the United Kingdom government as a dynamic component in developing an individual to conduct research appropriately at different levels of their educational evolvement. However, the National Grid for Learning launched by the United Kingdom government has placed emphasis on information, communication and technology skills rather than higher level information literacy and problem solving skills. As a result information literacy education in the United Kingdom features pockets of good practice but lacks coherence at national level because of government and partly owing to the reluctance of the CILIP, to endorse the SCONUL model beyond academia (Andretta 2005: 2). According to Andretta (2005: 35-37) the lack of eagerness by CILIP is certainly due to the organisation not recognising the primary focus of information literacy. The primary focus being, to produce an information literate individual who would be able to use these skills to improve their information needs. This can be achieved with the focus on creating an information literate individual rather than merely changing the platform from traditional to technological for transferring of information literacy skills. Further, the ACRL and ANZIL suggest that information literacy is an intellectual framework for "understanding, finding, evaluating and using information activities which may be accomplished in part by fluency with information technology, in part by sound investigative methods, but most important, through critical discernment and reasoning"(ACRL 2000: 3). According to Andretta (2005) all three models viz. ANZIL, ACRL and SCONUL are unanimous in the view that information literacy is a broader concept than information technology literacy and information technology fluency.

2.3.4 Association of College and Research Libraries model

This study is based on the understanding of information literacy from the ACRL's Information Literacy Competency Standards for Higher Education model. The ACRL's perspective on information literacy in higher education is not uncommon as it became widely accepted viewpoint globally. This is supported by Jiyane and Onyancha (2010: 2)

who state that while there are many definitions of information literacy none of which is commonly applicable universally the ALA's Presidential Committee provides what has come to be recognised as an all-encompassing definition of an information literate person.

Eisenberg, Lowe and Spitzer (2004) have also recognised the subsequent milestones in the development of information literacy in United States by the ALA. According to Webber and Johnston (2000: 382) experts note the linkage of information literacy and the ALA's ideals during the 1970s. Webber and Johnston (2000) further chart the acceleration of interest by the ALA in the 1980s in response to the recognition that computers and networks were set to revolutionise the field of information management and communication. This stimulus directed the awareness, need and the establishment of the ACRL Information Literacy Competency Standards for higher education.

Bundy (2004) states that the principles, standards and practices of the Australian and New Zealand information literacy higher education framework have been adapted from the ACRL information literacy model. SCONUL's model which is the Seven Pillars of Information Literacy model also encompasses standards from the ACRL's information literacy model. This study was also based on the Information Literacy Competency Standards for Higher Education as provided by the ACRL. They were considered appropriate for evaluating the information literacy skills of postgraduate engineering students at the DUT.

According to the ACRL (2000) an information literate person is able to:
- Determine the extent of information needed;
- Access the needed information effectively and efficiently;
- Evaluate information and its sources critically;
- Incorporate selected information into one's knowledge base;
- Use information effectively to accomplish a specific purpose;
- Understand the economic, legal, and social issues surrounding the use of information and access;
- and use information ethically and legally.

Each of these standards have been analysed and distributed into different areas including performance indicators and indicative outcomes by the ACRL. For example, one of the measurable outcomes to determine the nature and extent of information needed by a student, would be the student's ability to know how information is formally and informally produced, organised and disseminated. Thus these indicators and outcomes are valuable competencies to implement when assessing a learner's information literacy capabilities. It is therefore a model that can be used to measure, evaluate and identify gaps within learners conducting postgraduate research. Further, changes and recommendations can then be projected to improve a learner's information literacy skills at postgraduate levels.

The role of information literacy in higher education is therefore coherent with the ACRL model. This can be supported by Saunders (2009: 99) who observes that the ACRL have actively promoted information literacy as necessary for a knowledgeable society in general and especially for students in higher education institutions. Information literacy is thus the necessary skills acquired at a higher education institution by an individual as explained by the ACRL in creating a well-rounded human being to participate in various types of communities of practice.

2.4 Higher education and information literacy

The advent of the information age in the new millennium and the information explosion has challenged society. Society, notwithstanding their literacy levels, have effortlessly been able to access information through numerous technologies and formats. However, post 21st century and beyond the primary information hub has been the Internet which is accessible through various technologies. Access to information is one aspect but being able to use information responsibly, critically and objectively is vital in creating an individual who can make informed decisions in their daily lives. Fundamental to individuals using information responsibly, critically and objectively is the term information literacy.

As noted above, information literacy gained momentum in the 1990's and became a concept that was mainly being addressed by higher education libraries. However, as explained by Bundy (2002) that while information literacy is an issue that is and needs to be consistently promoted by higher education libraries to improve information literacy skills, it

is not exclusively a library issue but a global one that needs to be addressed by the global society.

Bundy (2002:3) affirms that in a world so dominated by information needs, issues and considerations, acceptance that information literacy is required for a person to function effectively as an individual in an increasingly global society seems axiomatic. This means that as early as the childhood stages of a learner's educational development the responsibility of information literacy should be apparent and it is therefore a lifelong learning experience and should not only be addressed by higher education institutions. Gross and Latham (2007: 2), elaborate that it is crucial to integrate information literacy skills education into every stage of an individual's development effectively if we aspire for learners to be participants in tomorrow's workforce. Learners need to achieve a level of information literacy that will allow them to find, assess, and use information critically in order to succeed in society.

Feast (2003: 81) observes that the need for tertiary graduates to acquire and develop information literacy skills has been emphasised in recent years in a world where many analysts believe access to information is not only important for survival but the key to prosperity. Higher education libraries are therefore also active role players in building an information literate society thereby creating a lifelong learner. However, as discussed in the Introductory chapter, the perception that postgraduate students at higher education institutions are well equipped to locate, access and use information responsibly for their research needs are debatable.

This is supported by Conway (2011: 130) who posits that it is a concern that students are completing their undergraduate study without the information literacy skills for successful postgraduate study or lifelong learning. However, while there is a substantial amount of research addressing information literacy and undergraduate students (Lampert 2005; Liu 2006) it is lacking for graduate/research students. Information literacy in higher education institutions appear to be fixated on the undergraduate programmes. Green and Macauley (2007: 317) also address this issue by stating that historically, efforts toward training and supporting graduate research students have developed as extensions of undergraduate programmes rather than being based on the specialized needs of postgraduates. Literature

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exposing postgraduate's lack of library searching skills, their need to acquire information management and synthesis skills, and the circumstances imposed upon them by presuming prior knowledge through undergraduate courses is fairly typical (Green and Macauley 2007).

Another issue that is apparent from the researcher's observation is the lack of attendance at information literacy training, workshops and lectures by students at the DUT. This trend is not unique to the DUT but is evident in higher education institutions globally. Latham and Gross (2013) in their study probed students as to their reasons for attending and not attending information literacy skills training. The reasons included the following:

- information literacy should offer course credit, extra credit, and an opportunity to improve their grades,
- students indicated that academics mentioned that it is optional and therefore they showed a lack of interest. They further indicated that they would rather not know that the information literacy skills training is not compulsory thus forcing them to attend,
- students also discussed the importance of scheduling, stating that they would be interested if the sessions were short and available at a variety of times in a convenient location,
- another important point mentioned was the perceived usefulness of the class and the librarian's reputation including their effectiveness of the instructional delivery of information literacy.

2.4.1 Higher education libraries in South Africa and information literacy

Higher education libraries have been one of the fundamental role players in initiating the importance of information literacy globally. Bundy (2002) believes that though information literacy is an issue that is and needs to be consistently promoted by higher education libraries to improve such skills and promote lifelong learning it is not exclusively a library issue. This is supported by Gross and Latham (2007: 1) who reiterate that students need to achieve a level of information literacy that will allow them to find, assess, and use information in order to succeed in school, the workplace, and their personal lives.

According to De Jager and Nassimbeni (2002) while the intent is clear that there should be an introduction to information and computer literacies in schools, the reality is that by the time students in South Africa reach higher education institutions, the vast majority have had little or no exposure to library and information resources and do not possess the skills to use them. Zinn (2000) in her study indicates that most schools from previously disadvantaged communities in South Africa lack basic learning resources and facilities such as access to libraries, books and computers. This is similarly addressed by Sayed (1999: 6-7) who made it clear that information literacy teachers within the South African context should recognise the fact that all students have not had equal prior access and exposure to educational resources of any kind. The same opportunities to develop skills that might be taken for granted in school leavers in the USA, the UK or Australia, were not and arguably still are not available to the majority of entrants into South African tertiary institutions. The responsibility of developing a student's information literacies and emerging lifelong learning values in South Africa therefore still largely remains the obligation of higher education institutions.

2.4.2 Postgraduate information literacy and higher education institutions
At academic libraries worldwide the concept of information literacy has been recognised. Higher education libraries globally have reconnoitred information literacy in the library environment for many years. Globally, higher education institutions depending on their policies vary in highlighting the prominence of information literacy to their student communities at undergraduate and postgraduate level. However, information literacy programmes, workshops and training at undergraduate level have been given precedence in most instances before postgraduate students as suggested by Lampert (2005) in her study at the California State University and Liu (2006) at the San Jose State University in the United States.

It is often assumed that postgraduate students have the necessary information literacy skills to conduct research because they have completed their undergraduate studies as stated by (Machet 2005; Kong, Hunter and Lin 2007; Streatfield, Allen and Wilson 2010; Bracke 2011; Harkins, Rodrigues and Orlov 2011). Many of them however, lack the skills needed to effectively organize and critically evaluate research. It is important to support students to conduct research at postgraduate level to improve the quality of their research. Information

literacy skills create an individual whom would be able to enhance their research and employment opportunities through lifelong learning. This is agreed upon by Harrington (2009) who elaborates that it is essential that graduate students are proficient in finding, organizing, and storing information, not only for the completion of their degree requirements, but also to succeed in securing future employment and research grants when competing with the increasing pool of qualified applicants. The concept of lifelong learning in information literacy connotes the inculcation of life skills to enable the learner to adapt to the constantly changing information society. Similarly, the context of self-directed learning implies an independent pursuit by the learner in a continuous search for knowledge by which he or she is capable of self-motivation and can critically assess or analyse any given situation and apply appropriate information literacy skills for problem-solving (Lawal *et al.* 2010). In a study done by Palmer and Tucker (2004) at the University of Deakin in Australia they also maintain that many universities have explicitly recognised and identified the link between information literacy skills and being an effective lifelong learner post-graduation. Thus, the coherent association between information literacy, lifelong learning and the development of graduate students to optimize research, employment and independent learning is key for the progress of an individual through postgraduate programmes.

According to Palmer and Tucker (2004) there has been and continues to be a fundamental change in industry, economy and society from a manufacturing and product basis to an information and service basis. This change in society requires people to be equipped to utilize information as a valuable resource and commodity. Palmer and Tucker (2004) further state that while students may be prepared to learn and become proficient in using computer software and technologies and familiarizing themselves with information retrieval systems offered to them by academic institutions in which they study, it is also important that they develop generic information seeking skills that they can apply in different contexts. Thus, it is therefore essential that at postgraduate level students not only understand the concept of information literacy but are able to articulate research outcomes by having proficient and responsible information literacy skills.

Literature in recent years confirms a gradual awareness among academic librarians of the scattered, unique and complex needs of postgraduate researchers (Wainwright 2005; Green

and Macauley 2007; Hoffmann *et al.* 2008). As a result, there is a growing recognition that postgraduate researchers need to develop various skills (Booth and Tattersall ; Genoni, Merrick and Willson 2006; Streatfield, Allen and Wilson 2010). There is also evidence of positions specifically created in academic libraries to focus on research support, often advertised as: "Research support librarian", "Research support specialist", or "Research liaison manager" as suggested by Brewerton (2012: 98) in his study for research libraries in the United Kingdom. This is also the situation at the DUT were the library has created a specified position in 2009 titled "Postgraduate librarian". This confirms that that there are opportunities to develop services specifically aimed at researchers in the 21st century (Bent, Gannon-Leary and Webb 2007; Carlson 2012).

The awareness among academic librarians to engage more deeply with the information needs of postgraduate researchers has, however, been associated with marginal effort (Jankowska, Hertel and Young 2006; Streatfield, Allen and Wilson 2010; O'Grady and Beam 2011) and with varying levels of success (Hoffmann *et al.* 2008). Without a uniform strategy available across universities (Streatfield, Allen and Wilson 2010: 235), many academic librarians may be unsure regarding the way forward with respect to supporting the information needs of postgraduate researchers (Brewerton 2012: 97). Academic libraries may therefore currently be failing to offer services which are addressing crucial information needs of postgraduate researchers (Gomersall 2007: 301; Streatfield, Allen and Wilson 2010: 230; Bracke 2011: 72). This situation may be true for academic librarians in South Africa, because most of the existing studies conducted regarding the support of the information needs of postgraduate researchers have been performed outside the borders of South Africa as referred to by du Bruyn (2013: 3). Du Bruyn's study is one of the few that focused on the postgraduate students' information literacy skills within the South African context at the Vaal University of Technology. According to Du Bruyn (2013: 8) research clearly confirms that within the South African context it is evident that information literacy support to postgraduate researchers should build on information literacy support initiatives offered for undergraduate students.

2.4.3 Postgraduate information literacy and higher education institutions in Africa
The pattern of marginalisation of postgraduate student's information literacy skills is also prevalent in Africa. Mnthali as cited in Fidzani (1998: 332) indicates that at the University

of Botswana, Masters students were not oriented to the use of online information retrieval tools. Fidzani (1998: 337) in his study concluded that graduate students at the University of Botswana lacked information literacy skills. His research further illustrated that graduate students do not have adequate training in the use of library resources and that some of the students are unaware of the services the library has to offer. In a study conducted by Omeluzor *et al.* (2013: 3) at Babcock University in Nigeria the results indicated that information literacy skills programmes were only addressed at undergraduate levels whilst postgraduate students were marginalized.

This trend is also apparent in South African higher education institutions. According to Somi and De Jager (2005) who conducted a survey at the University of Fort Hare in South Africa, on both postgraduate and undergraduate students, the following was established:

- More than half the students do not attend library orientation sessions in spite of it being compulsory;
- Even if students do attend library orientation sessions, they do not learn a great deal more than how to photocopy and what the library rules are;
- Students do not seem to be very confident in using the OPAC; many were not familiar with reference sources or journals and seemed not to understand the classification scheme;
- Using the Internet is a popular way to search for information, but it is also extensively used for non-academic purposes.

Another observation is that these findings suggest that the lack of information literacy skills at postgraduate level could be due to large numbers of students at undergraduate level not being exposed to information literacy and thereby filtering into postgraduate programmes underprepared for research.

Thus, it is important that students gain information literacy skills as they progress through their undergraduate career so that they can optimally access and use the library resources for their research needs at the postgraduate level. The research activities of postgraduate students will also be complemented by support from the postgraduate librarians in terms of further developing their skills in locating, critically analysing and objectively using information resources.

2.4.4 Postgraduate information literacy at the DUT

The mission of the DUT library is to be a student-centred library that enhances learning, teaching and research through the provision of information services, access policies and instruction programmes in line with the objectives of the University. The information literacy programme that the library offers supports the student-centred approach by focusing on certain key areas. These areas are teaching, learning, research, encouraging lifelong learning, providing information literacy skills training, ensuring equitable access to information and using appropriate technology.

The DUT consists of six faculties with engineering being one of them. The information literacy programme at DUT stretches across all six faculties. The information literacy programme at DUT also recognises the ACRL model as the benchmark in teaching information literacy skills. The information literacy programme at the DUT is based on the ACRL model. The ACRL model has been used to devise learning outcomes, assessments and assessment criteria for students at undergraduate levels. These learning outcomes, assessments and information literacy support are made available to students via the DUT library website through the online information literacy learner guide. The DUT library homepage provides access to information literacy guides and tutorials that can be accessed and used by students to improve their information literacy skills.

According to Neerputh (2012: 260) DUT adopts a three step programme in information literacy aimed at students from the first to third years of study. The first year information literacy programme encapsulates teaching students to recognize when information is needed and have the ability to locate, evaluate, and use the needed information effectively through searching the library discovery tool (this tool offers users a way to search the library catalogue and the online information resources e.g. databases, e-journals, e-books that the library subscribes to using one search box) and the library catalogue. In addition, topic analysis to help with learner's assignments and referencing techniques as required by the department are also offered. The second and third year students are also provided information literacy training as determined by academics within the respective departments. This is discussed in the DUT library annual report where issues such as attendance, assessments and the importance of information literacy through illustrations such as graphs and narratives are presented to the university community.

It is therefore apparent from the approach taken to have a three step programme for undergraduate students that there seems to be a lack of urgency to address information literacy skills of postgraduate students at the DUT. This can be concluded because there has been no information literacy programme developed with objectives and outcomes as has been done with the undergraduate courses.

This view is also shared by the researcher who has observed that, information literacy training programme initiatives for postgraduate students have been marginalised in relation to undergraduate information literacy programmes at the DUT. However, there has been a change in the past two years with the employment of postgraduate librarians. There has been a growing importance placed on improving the information literacy skills of postgraduate students at the University to enhance the research throughput rate.

The postgraduate librarians have been instrumental in marketing, promoting and hosting information literacy workshops for postgraduate students but there is still uncertainty surrounding the information literacy skills of postgraduates at the DUT. Postgraduate information literacy programmes are not based on the ACRL model or any other information literacy model at DUT. It does not have varying approaches to information literacy as with the undergraduate programmes at the DUT. It is therefore not an established component in terms of being recognised, developed and implemented as with the undergraduate courses.

2.5 Information and communication technology and higher education in South Africa

Society in the 21st century is characterized by a rapidly changing information and technological environment. The need for society to have information searching skills is apparent more than ever before (Fourie and Bothma 2006). Czerniewicz and Brown (2009) state that the concepts of globalisation and information and communication technologies (ICTs) are often twinned in the discourse of the new world order known variously as "the knowledge society", "the informational economy" and "the information age". Tinio (2003) defines ICTs as diverse technological tools and resources that are used to: communicate; create information; disseminate information; store information; and, manage information.

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Many experts have stressed the importance of ICTs to higher education institutions. Worldwide, ICTs are considered a basic requirement of the knowledge society for which universities now prepare their students (Burbules and Callister Jr 2000; Waema 2002). Cullen (2001) defines the digital divide as the gap or divide that exists between those with ready access to ICT tools and those without such access or skills. ICTs are used in relation with the terms digital divide and computer literacy because they addresses similar issues such as access, technology and communication technology. Naidoo (2011) in her study on the digital divide at the DUT observes that within the South African tertiary education context that there are students who fall into both these categories: some students have had no such access or skills and yet there are also those who have had access and are skilled in the use of, and have vast experience with ICTs.

South African higher education institutions see information technology as the central solution to the problems experienced by disadvantaged students. This is claimed by the Department of Education (2001) which does clarify that while the innovative use of technology is to be welcomed, there is a strong risk that approaches which focus on improving delivery through ICT, and which leave traditional curricular structures unchanged, will not provide a comprehensive solution. Importance has to be placed on bridging the gaps in computer literacy, the digital divide and information and ICT competencies at all levels of the education spectrum before using cutting-edge technologies to assist in resolving the lack of various forms of literacies including information literacy. As mentioned earlier the DUT also has to be an active participant in building high competency levels in this regard. The technological support through workshops, training initiatives and modules offering opportunities to learn and improve ICTs skills for students entering higher education institutions within South Africa is important. Through such initiatives students can be introduced to ICTs or improve their ICT skills depending on their competency and technological needs.

The spectrum of experience with regard to ICTs vary within developing countries such as South Africa with some students coming from privileged backgrounds who could form part of the global digital native population, whilst other students are only introduced to ICTs when they first enrol for their studies at a university. Thinyane (2010) supports this view pointing to the diversity within the first year students involved from his study. The

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challenge for educators and higher education institutions administrators is how to cater for the different range of ICTs skills that students bring with them when they enter University. The role of ICTs therefore needs to be addressed and put into perspective by South African higher education institutions which need to be mindful of the fact that students enter universities from diverse social, economic and cultural backgrounds and therefore they have no, little or varying levels of ICTs skills. This will help higher education institutions in South Africa to find solutions to these problems in using ICTs that are currently occurring in programmes such as information literacy.

2.6 The digital divide and higher education in South Africa

The lack of exposure to technology within Africa is the result of the economic environment of the African continent. Mutula (2005a: 592) affirms this testifying that the digital divide in developing countries in general and Africa in particular is closely tied to the contextual economic environment of the respective countries. However, the concept of the digital divide is not restricted to third world countries as access to and use of computers is a major issue of concern in developed countries such as United States of America as well (Attewell 2001).

Mutula (2005b) refers to the digital divide as the inequitable access to information and communication technology (ICT), or access to and effective use of technologies. He further explains that the digital divide is a "multi-dimensional phenomenon" which could be categorised into three sections, namely, divergence of Internet access in developed and developing societies, the gap that exists between the information rich and the information poor and the divide that dictates who uses or does not use technology.

Higher education institutions in post-apartheid South Africa also face the challenges of the digital divide. A large number of South African students entering higher education institutions have not been exposed to technology and digital information (Czerniewicz and Brown 2009). One of the features of apartheid was that South African schools were separated and funded according to race (Howie, Muller and Paterson 2005). Although the majority of the current population of first year University students would have completed their entire primary and secondary education in post-apartheid South Africa, the disparities of the past still have a large effect on higher education today. Former Department of

Education and Training schools, House of Representative schools and House of Delegate schools tend to be more disadvantaged than former House of Assembly schools (previously white only schools). However the impact of the digital divide is largely prevalent at former Department of Education and Training schools whom are still disadvantaged because the schools are typically unable to levy fees to increase resources, particularly for computer laboratories (Galpin and Sanders 2007).

Learners at the DUT are not exempt from this issue. Numerous students who attend this University belong to the previously disadvantaged communities who are still facing the challenges of the digital divide in post-apartheid South Africa. This is evident from the researcher's observations and interactions with students. Many students from previously disadvantaged communities who constitute the large majority on campus lack exposure, use and access to technology. There are numerous examples and experiences the researcher can relate to in terms of the digital divide within the DUT context. These include students using computers for the first time including the Internet and in many instances even a library.

Information literacy skills in the 21st century largely depend upon being able to access information using technology and being able to manipulate technology to locate, access and use information responsibly. One of the issues that influence the swiftness of teaching information literacy skills is the digital divide at the DUT. Information professionals at the DUT have to be mindful of the diversity of learners within a classroom environment and their lack of exposure to these basic technological skills when teaching information literacy skills. This results in the curriculum and learning outcomes for information literacy at the DUT to be negotiated at undergraduate level to accommodate our learners.

2.7 Summary

In Chapter two, information literacy and its origins were discussed. This chapter also examined the different information literacy conceptual frameworks that can be applied to higher education institutions globally and at the DUT where the current study was conducted. The bulk of this chapter described various aspects relating to postgraduate information literacy including within the South African context with the observations as experienced by the researcher at the DUT in relation to students. The literature reviewed in

this chapter also examined the concepts of digital divide, ICTs and information literacy. The next chapter discusses the methodology followed in conducting the study.

Chapter three: Research methodology

3.1 Introduction

Research methodology guides the researcher to understand how to learn, identify and find solutions to a research problem (Blanche, Durrheim and Painter 2006). Bless, Higson-Smith and Kagee (2006) state that research is when an individual identifies a problem, formulates and defines a research question and then finds a logical means to find solutions to the research question. The research problem addressed in this study involved the information literacy skills of postgraduate engineering students at the DUT and therefore the objective was to investigate and recommend guidelines in improving and enhancing postgraduate information literacy skills of the engineering students at the DUT. The key questions of this research were to explore the following:

- What information literacy skills do postgraduate engineering students bring from their undergraduate studies at the DUT?
- What are the major challenges postgraduate engineering students experience in learning and applying information literacy skills?
- How can information literacy skills be enhanced amongst postgraduate engineering students?

Wisker (2007) appropriately describes research as enquiring and investigating, searching for knowledge and trying to comprehend the world and practices involved in the world. Although interest in information literacy in higher education institutions gained momentum in the 1990s and has become the focus of creating an objective and independent lifelong learner it is constantly evolving. Hence this study attempted to determine the information literacy skills of postgraduate engineering students at the DUT. Wisker (2007) further points out that research is constructed on examining methods and assumptions which contribute to existing knowledge in a specified field. This chapter therefore discusses the research methodology as it relates to this study.

3.2 Research methodology

Research methodology is the principle and philosophy that guides research (Naidoo 2011). According to Wisker (2007) the type of methodology selected and data collection method for the research flows naturally from the research topic and research questions that underpin

the research. The current study investigated the information literacy skills of postgraduate engineering students at the DUT and thus the researcher opted to use survey research to collect data. Bless, Higson-Smith and Kagee (2006) maintain that the research problem, the amount of knowledge at the inception of the investigation of the problem, the properties of the variables and the purpose of the enquiry all influence the research method that is chosen. This is supported by Babbie and Mouton (2001: 75) who describe research methodology as a process in research using objective and unbiased procedures and tools to solve a research problem. Research methodology guides the researcher to understand on how to study, identify and find solutions to problems (Blanche, Durrheim and Painter 2006). This is clarified by Bless, Higson-Smith and Kagee (2006: 1) explain that research is about defining a research question and then finding a systematic method to find solutions to the research question.

In determining the information literacy skills of postgraduate students at the DUT this study used both quantitative and qualitative approaches. According to Creswell (2014) the quantitative approach takes scientific explanation to be based on universal laws. Its main aims are to objectively measure the social world, to test hypotheses, predict and control human behaviour. A quantitative study may therefore be defined as an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers and analysed with statistical procedures in order to determine whether the predictive generalisations of the theory hold true (Creswell 2014).

In terms of the qualitative approach McRoy (1995) states that it stems from an anti-positivistic, interpretative approach, is idiographic and thus holistic in nature and aims to understand social life and the meaning that people attach to everyday life. Qualitative research is based on an inductive approach. This involves developing and building inductively based new interpretations and theories of first-order descriptions of events, rather than approaching the social actors with deductively derived research hypotheses (Babbie and Mouton 2001). The qualitative research approach in its broadest sense refers to research that elicits participant accounts of meaning, experience or perceptions. It also produces descriptive data in the participant's beliefs and values that underlie the phenomena. The qualitative researcher is therefore concerned with understanding rather than explanation, naturalistic observation rather than controlled measurement and the

subjective exploration of reality from the perspective of an insider as opposed to the outsider perspective that is predominant in the quantitative paradigm (McRoy 1995). A qualitative study is therefore concerned with non-statistical methods and small samples often purposively selected.

The use of both qualitative and quantitative approaches is based on the grounds that research is complex and diversified in practice and cannot be perceived in terms of compartmentalisation (Brannen 2005: 173-184).This is substantiated by Bryman (2012) who maintains that there are situations and topics in research that are better served by a marriage of two traditions. In addition, Cohen, Manion and Morrison (2013) suggests that paradigms can be used together to demonstrate coexisting validity from both methods. Hence the quantitative approach was suitable for the purpose of this study in determining the information literacy skills of the postgraduate engineering students at the DUT whilst the qualitative approach was pragmatic to obtain the views of the postgraduate librarians who are involved in teaching information literacy to postgraduate students.

3.3 Data collection methods

As with research approaches, data collection methods fall into two broad categories, namely, quantitative and qualitative. The former, at a surface level, involves collecting numerical data or data which can be counted, the latter involving methods which collect textual or verbal data (Bertram and Christiansen 2014).

In terms of the quantitative approach, the survey method (using a self-administered questionnaire) was adopted. The survey method is appropriate because the objective was to describe, analyse, ascertain and interpret the information literacy skills of post-graduate students in the Engineering Faculty at the DUT. According to Fortune and Reid (1999: 93) the following can be added with regard to the quantitative approach:

- The researcher's role is that of an objective observer whose involvement with phenomena being studied is limited to what is required to obtain necessary data;
- Studies are focused on relatively specific questions or hypotheses that remain constant throughout the investigation;
- Plans about research procedures (design, data collection methods, types of measurement etc.) are developed before the study begins;

- Data collection procedures are applied in a standardised manner e.g. all participants may answer the same questionnaire;

- Data collectors such as interviewers or observers are expected to obtain only the data called for and to avoid adding their own impressions and interpretations.

- Measurement is normally focused on specific variables that are if possible quantified through rating scales, frequency counts and other means;

- Analysis proceeds by obtaining statistical breakdowns of the distribution of variables and by using statistical methods to determine associations or differences between variables.

Further, in the case of higher education institutions within the South African context findings from survey approaches have been key in helping improve student's information literacy skills. This can be supported by De Jager and Nassimbeni (2005) who state that survey interventions including workshops have produced meaningful results in South African higher education institutions. As stated by Babbie and Mouton (2001: 258), it may be appropriate to administer the questionnaire for a survey to a group of respondents gathered at the same place at the same time. In terms of this study, postgraduate engineering students at the DUT were accessible collectively through postgraduate research clinics at the University as well as through e-mail and library training initiatives.

The qualitative approach was underpinned by using semi - structured interviews. This is supported by McRoy (1995) who states that the qualitative research paradigm in its broadest sense refers to research that elicits participant accounts of meaning, experience or perceptions. According to Fortune and Reid (1999: 94) methods such as participant observation and interviewing are used to acquire an understanding and knowledge of how the persons involved conceptualise and perceive their community of practice. Fortune and Reid (1999: 94) add the following characteristics of the qualitative approach:

- The researcher attempts to gain a first hand, holistic understanding of phenomenon of interest by means of a flexible strategy of problem formulation and data collection shaped as the investigation proceeds;

- Methods such as participant observation and unstructured interviewing are used to acquire an in-depth knowledge of how the persons involved construct their social world (insider role);
- As more knowledge is gained the research question may shift and the data collection methods adjusted accordingly. This involves the investigator constantly analysing data using formal logical procedures although final analysis is ordinarily completed after the early immersion phase of the study;
- Qualitative methodology rests on the assumption that valid understanding can be gained through accumulated knowledge acquired at first hand by a single researcher.

In this instance the community of practice was the postgraduate librarians at the DUT. The postgraduate librarians were selected to be interviewed as they are the ones providing a library service to the postgraduate students. In addition they are also involved in the information literacy training of these students. The postgraduate librarian's views, perceptions and observations was needed in order to have a better understanding of the postgraduate student's information literacy skills prior to the training initiatives.

3.4 Population and sampling

Bless, Higson-Smith and Kagee (2006) describe a population (sometimes referred to as a target population) as the set of elements that the research focuses upon and to which the results obtained by testing the sample should be generalised. It is therefore absolutely essential to describe accurately the target population (Bless, Higson-Smith and Kagee 2006: 99). While information literacy is offered to all students at the DUT, in terms of this study the researcher only investigated the information literacy skills of the postgraduate engineering students. This group of students thus comprised the population to be investigated. Bless, Higson-Smith and Kagee (2006: 99) further explain what the operational definition of population is: "it is the boundary condition which allows the researcher to establish whether or not an element belongs to a population."

In the case of this study, the first boundary that can be considered is that the population was selected only from the DUT. Then, as highlighted above, while all students at DUT are offered some components of information literacy instruction it was only postgraduate engineering students who were included in the population of this study. There were 80

postgraduate engineering students registered at the time of this study. All 80 students were targeted and as a consequence no sampling was done. The 80 students consisted of 12 Doctoral and 68 Masters students within the Faculty of Engineering. The distribution of the questionnaires is described and discussed under 3.8 below.

A further boundary is that although there were twelve subject librarians and two postgraduate librarians employed at the DUT at the time of the study only the two postgraduate librarians were selected. As with the engineering students, because of the small numbers involved, no sampling was done on the postgraduate librarians.

3.5 Questionnaire design and structure

Questionnaires have to be very cautiously designed. A good survey instrument has questions that meets the research objectives. This is achieved through testing the survey instrument through reliability and validity (Fowler 2013). According to Babbie and Mouton (2001) questions should be precise, avoid bias and should be ordered from general questions to more specific questions. The self-administered questionnaire used in the study by the researcher consisted of questions that assessed the information literacy skills of postgraduates and was based on the ACRL's Competency Standards Information Literacy model. There are five competency standards as created by the ACRL and each of these has been disseminated into different areas termed performance indicators and indicative outcomes. The standards focus upon the needs of students in higher education at all levels. The competencies outline the process by which academic staff, librarians and others pinpoint specific indicators that identify a student as information literate.

These standards are applicable within the DUT context as the current library information literacy module at the DUT is based on the ACRL's Competency Standards Information Literacy model. As stated earlier it was therefore logical for the researcher to apply this model and devise a questionnaire based on these standards to assess the skills of the postgraduate engineering students at the DUT. For example, one of the performance indicators of this study was to identify keywords and search strategies that describe the information needed based on the extent of information needed competency standard. Students had to critically apply their knowledge of the extent of information needed

competency standard to achieve the expected indicative outcomes in responding to the questionnaire when being able to identify keywords and search strategies.

The objective of the researcher was to create a questionnaire that assessed the information literacy skills of the postgraduate engineering students. Hence the indicators and outcomes noted above are valuable competencies to implement when assessing and evaluating a learner's research capabilities. Though the ACRL's Competency Standards Information Literacy model was used to measure, evaluate and identify gaps of postgraduate engineering students' information literacy skills the researcher recognised that is was important to construct the questions in such a way to allow students to be objective in their response to avoid bias.

A self-administered questionnaire was chosen as the data-gathering instrument because of its advantages which, as far as the author is concerned, outnumber the disadvantages in this particular study. The questions for the self-administered questionnaire were devised by the researcher. The advantages are as follows:

- questionnaires are less expensive than other methods;
- produce quick results and thus save time;
- offer greater assurance of anonymity;
- offer fewer opportunities for bias or errors caused by the presence or attitude of the interviewer.

Although the advantages of self-administered questionnaire outweigh the disadvantages there are few when conducting research that had an impact on this study. These include the following:

- the inability to obtain clarification or details;
- less control over how the questionnaire is filled in;
- higher rejection rates by candidates;
- very low response rate when questionnaires are mailed;
- limited control through observation.

Lastly, the researcher had to decide whether open-ended or closed questions were going to be used in the questionnaire for the research. The researcher decide on using closed ended

question. This allowed the researcher to collect data that was easy to analyse and increased the reliability of the information gathered.

3.6 Design of interview schedule

There were various issues that needed to be taken into consideration when designing the interview schedule. King and Horrocks (2010) identify the kind of questions the researcher should ask to attain the preferred outcomes from the analysis. Secondly, King and Horrocks (2010) highlight the choice of the questions asked, that is, the array of experience that the research attempts to scrutinise. The researcher was aware of the objectives of the study including the broader issues to be examined when compiling the questions to be asked of the postgraduate librarians.

The third issue that King and Horrocks (2010) emphasise is the challenge to circumvent presumptions in the research questions that could misrepresent the research. The researcher was mindful of this in designing the interview schedule and every effort was made to ensure that preconceived views and perceptions were not inherent in the questions asked for this study. The questions asked were explicit and thus very little rephrasing was needed during the interview (Babbie and Mouton 2001: 253). The interview schedule covered the research problem and objectives (Bloomberg and Volpe 2012: 82-83). Thus the researcher ensured that interview questions linked directly to the research objectives of the study. The questions were specific, arranged from general questions to precise questions and avoided prejudice (Babbie and Mouton 2001: 250).

Thus, this ensured that throughout the research not only during the interview process that objectivity was maintained before and after the interview process. It is important not to have preconceived views and perceptions when investigating a research problem. The researcher was heedful of these issues when designing the interview schedule and addressing the participants ensuring that the data collected addressed the research problem. This guided the design and interview process ensuring data validity including transparent results.

There are various types of interview schedules that can be used when conducting research. These include focus group interviews, face-to-face interviews and computer-assisted telephone interviewing. In terms of this study the researcher conducted semi- structured

face-to-face interviews with the postgraduate librarians. In structured interviews the interviewer is rigid in terms of the questions asked and nothing further is explored, maintaining control of the questions and the answers as represented in the interview schedule (Denscombe 2003: 166). This can prevent the interviewee from expressing their views and opinions leading to certain ideas that the interviewee may have that could be lost.

Semi-structured interviews, on the other hand, allow the interviewer to explore further to acquire clarification or find further information on the research topic (Bless, Higson-Smith and Kagee 2006: 119), as was the case in this study. Hence the researcher used semi-structured interview schedules as it allowed the researcher to probe for more detailed explanations on the interviewee's thoughts and ideas and to collect data that may well have not been elicited should a more structured approach have been adopted.

The questions in the interview schedule were arranged in a particular manner. The beginning of the interview schedule began with data based on qualification, experience and how many years the postgraduate librarians have been with the DUT. These were considered non-threatening questions and ones that would encourage a good rapport. King and Horrocks (2010:55) indicate that it is important to maintain a non-apprehensive and simple beginning to the interview process.

King and Horrocks (2010: 56) advise that it is common for more challenging and expressively charged questions to be asked once the interview process has progressed. As the interview process progressed the interviewer, who in this study was the researcher, asked more detailed and thought provoking questions, which supported the researcher in better understanding the perspectives of the interviewees on the topic. The researcher queried and quizzed as to ascertain the perceptions of postgraduate librarians understanding of postgraduate engineering students' information literacy skills.

The issues raised in the interview schedule were designed to correlate with those raised in the questionnaire that was administered to the postgraduate students in order to strengthen the validity of the data collected. The questions raised in the interview schedule probed the current information literacy skills of postgraduate engineering students, whilst the questionnaire assessed the current information literacy skills of postgraduate students.

3.7 Pre-testing the questionnaire

According to Babbie and Mouton (2001) and Bless, Higson-Smith and Kagee (2006) pre-testing is crucial to ensure reliability and validity of the questionnaire. Maree (2007: 150) maintains that ensuring validity through pre-testing is important. Babbie and Mouton (2001) outline the errors that can occur in the design of a questionnaire as follows: "there is no piloting of the research instrument; there are ambiguous, double-barrelled or vague questions, and undefined terms; the researcher assumes things about the respondents; the researcher asks questions that the respondents do not have knowledge about; and lastly, the researcher asks leading questions." According to Maree (2007) content validity is defined as the extent to which the instrument covers the complete content of the particular construct that it is set out to measure as it is important and relevant to the instrument. The authors point out that to ensure the content validity of an instrument, the researcher usually presents a provisional version or a pre-test in the field being investigated before finalising the instrument (Maree 2007).

It is for these reasons the researcher guarded against the list of errors by pre-testing the questionnaire. The questionnaire for this study was pre-tested on a sample group of five students. They were randomly selected from the postgraduate students at the DUT.

Further, respondents for the pre-test were selected from the Postgraduate Research Commons only accessible to students involved in research in the library. The researcher explained the purpose of the study and that confidentiality was guaranteed. The researcher was available in the library throughout the session to answer respondents' questions. After the respondents had completed the questionnaires they were submitted to the researcher. The researcher checked all questionnaires and it was evident that the pre-test respondents had no problems.

The conclusion reached was that the questionnaire was valid and reliable as it appeared understandable to the pre-test respondents. This corresponds with the literature, which suggests that unless the researcher can be sure that the measurement techniques are actually measuring the things they are supposed to be measuring, the results will be difficult to interpret (Bless, Higson-Smith and Kagee 2006). The interview schedule was not pre-tested as the questionnaire. It was believed that the researcher would be present to offer

clarification, if needed. The respondents in the interview survey were also familiar with the information literacy programme and the issues that are experienced with postgraduate students.

3.8 Administering the questionnaire

The postgraduate engineering students were targeted, through e-mail correspondence. Initially, the intention was to target the students through the research clinics and information literacy training initiatives organised by the university and the library. However this did not come to fruition as the semester was culminating in examinations and the research clinics and library information literacy training initiatives had already been completed. As a consequence, the engineering postgraduate students were targeted via e-mail.

In contacting the students, the researcher liaised with various research coordinators in the Faculty of Engineering. These coordinators are the individuals who support postgraduate students' research within the Faculty of Engineering. E-mails were sent out to various research coordinators with the questionnaire attached. They were asked to forward the email to the students under their support. The research coordinators were cooperative in doing so. When forwarding the email the coordinators also indicated the importance of their (the students) participation and the need to complete the questionnaire as soon as possible.

A total of 30 postgraduate engineering students responded giving a response rate of 38%. The "average" response rate (See 5.1.1 for more discussion of this) can be attributed to the latter part of the second semester being an extremely busy time of year for post-graduate students as they were involved in the completion of their research projects. It was nearing the end of the second semester, when students involved in postgraduate research are engaged in various academic and non-academic efforts. Thus, 30 postgraduate engineering students completed the questionnaire and these questionnaires were used in the data analysis described below.

3.9 Data analysis

Data was analysed using the SPSS computer programme. According to Babbie and Mouton (2001: 583), the computer and SPSS are simply tools to:

- summarize data;
- compile appropriate tables and graphs;
- examine relationships among variables;
- perform tests of statistical significance, based on one's hypotheses;
- develop fairly sophisticated models.

SPSS is very helpful in handling large quantities of data, finding patterns and testing hypotheses.

3.9.1 Coding of the data

The coding was simple because the questions used to assess postgraduate student's information literacy skills were closed-questions. Responses were given a numerical value and these were entered into SPSS. Once the data had been entered the tables of frequencies and descriptive statistics were generated. These are reflected in Chapter four.

3.10 Summary

In this chapter the research method adopted for the study was described and evaluated. It reviewed the research design and the research methods used in this study. The data collection technique and instruments were discussed and the description of the population and sampling was outlined including how the collected data was analysed. The next chapter presents the analysis and research results of the study.

Chapter four: Research results

4.1 Introduction

In this chapter the research results are presented. The questions that were asked were based on the purpose and objectives of the study.

The results will be explained according to the sub-headings of the questionnaire which has been based on the understanding of information literacy from the Association of College and Research Libraries, ACRL (2000) Information Literacy Competency Standards for Higher Education model. The sub-headings of the questionnaire are as follows:

- Demographic questions
- Level of familiarity with extent of information needed
- Level of familiarity of accessing information
- Level of experience in evaluating information and its sources critically
- Level of experience in incorporating selected information into one's knowledge base
- Level of experience in using information effectively to accomplish a specific purpose
- Level of experience in understanding the legal and ethical use of information

4.2 Presentation of findings

Data collected was analysed and the findings are presented where possible, by means of graphs or narratives. The research included two population groups. Data from each group was collected using a different research instrument. A questionnaire was used to collect data from postgraduate engineering students. The data collection process for postgraduate librarians was conducted using semi-structured interviews. A total of 30 postgraduate engineering students participated in the survey out of a total of 80 postgraduate students who were contacted giving a response rate of 38%. In terms of the post graduate librarians both participated in the interview. The findings for the postgraduate librarians were scrutinised using content analysis of the interviews. The findings are presented in a narrative form, grouped by themes and frequency counts where possible.

4.3 Presentation of findings of questionnaire survey of postgraduate engineering students

Data was collected from postgraduate engineering students from the DUT, Durban campus. The section that follows presents the findings of the survey using a questionnaire.

4.3.1 Demographic data of postgraduate engineering students in the study

Various demographic type questions were asked of postgraduate engineering students. These included race, level of postgraduate study and information literacy instruction during their undergraduate study and extent of preparedness.

4.3.1.1 Registered postgraduate engineering students per race

Respondents were asked to indicate their race for the purpose of this study. Figure 1 indicates that more than half (53%) were African students whilst the other half comprised Coloureds (3%), Indians (37%) and Whites (7%).

Figure 1: Race of respondents

[N=30]
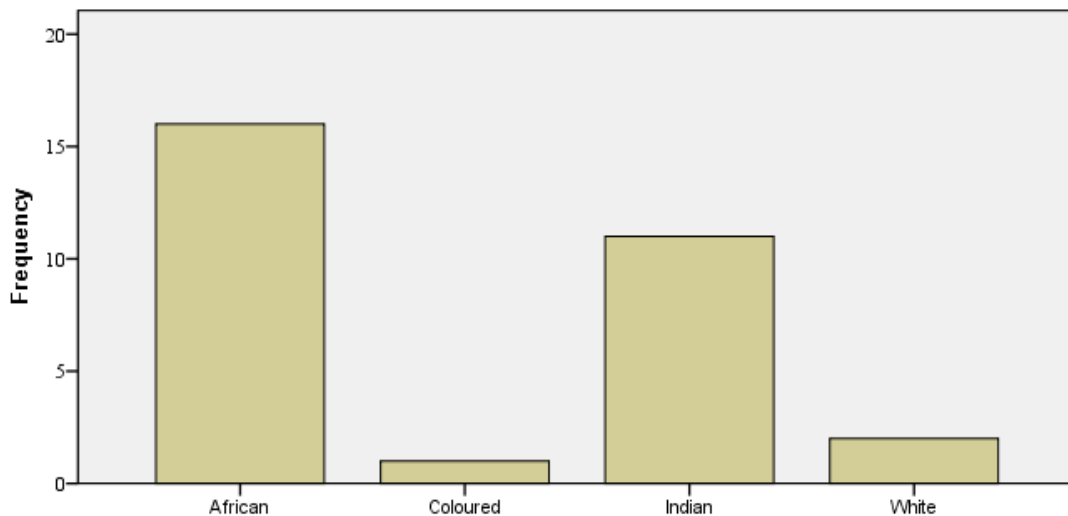
4.3.1.2 Registered postgraduate engineering students per level of study

Respondents were asked to indicate their level of postgraduate studies. Of the 30 postgraduate students that responded to this question, 27 (73%) of students were in a master's programme and 8 (27%) were in a doctoral programme within the Faculty of Engineering. There were no respondents in this study from post-doctoral engineering programmes.

Figure 2: Level of study

[N=30]
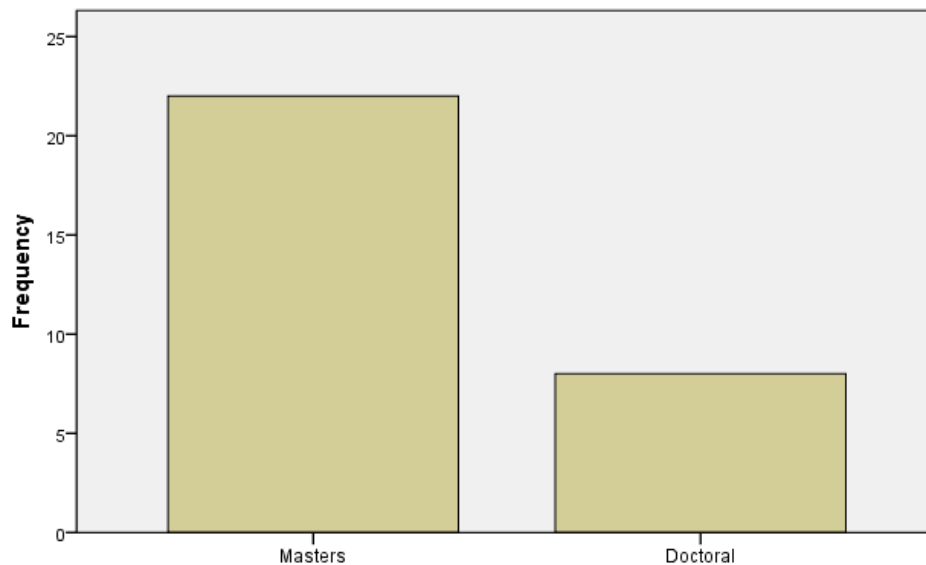
4.3.1.3 Information literacy instruction at undergraduate studies at DUT

Figure 3 indicates that 8 (27%) of respondents stated that they did attend information literacy instruction whilst 21 (70%) indicated that they did not attend information literacy instruction during their undergraduate studies at DUT. The remaining three percent of respondents were unsure whether they attended information literacy instruction at DUT. This indicates that most students from the Faculty of Engineering at DUT did not attend undergraduate information literacy instruction at DUT.

Figure 3: Attendance of information literacy instruction at undergraduate level at DUT

[N=30]
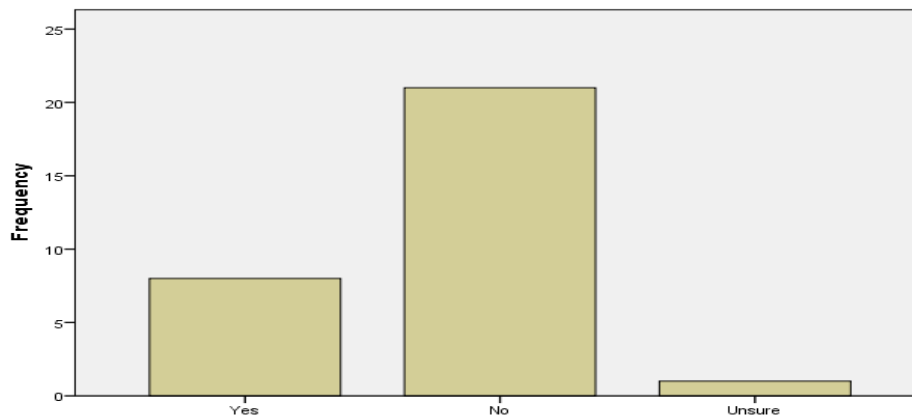
4.3.1.4 Information literacy instruction at undergraduate studies at any other institution

Respondents were asked to indicate whether they attended information literacy instruction at any other institution at undergraduate level of their studies. Figure 4 illustrates that 10 (33%) of the respondents did attend information literacy instruction at other institutions. Four percent of the respondents were unsure whether they attended information literacy instruction at any other institution. Of the 30 respondents who indicated attending information literacy, 19 (63%) engineering postgraduates indicated that they did not attend information literacy instruction at any other institution.

Figure 4: Attendance of information literacy instruction at undergraduate level at another institution

[N=30]
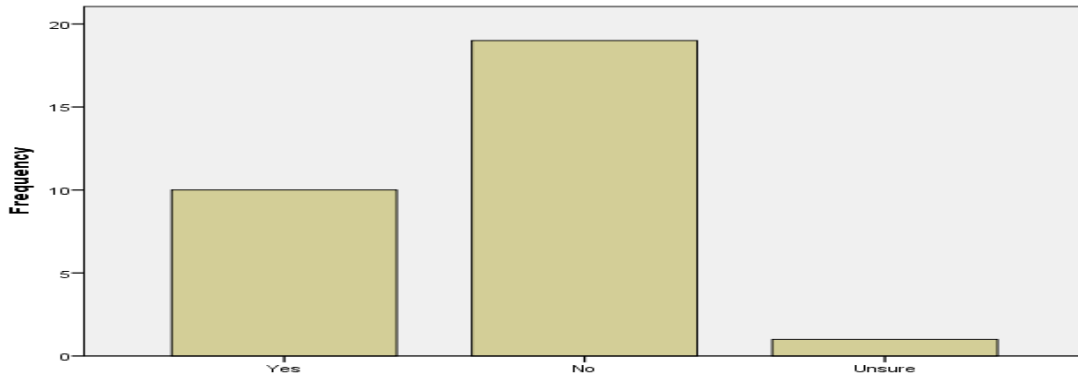
4.3.1.5 Extent of preparedness to access and use information resources

Respondents were asked to indicate the extent of their preparedness in terms of being able to effectively access and use the information resources available via the DUT Library. It was interesting to note that an overwhelming majority of 21 (70%) respondents indicated that they were considerably or adequately prepared for being able to effectively access and use the information resources available via the DUT Library while only nine (30%) indicated that they were not prepared at all in being able to effectively access and use the information resources available via the DUT Library.

Figure 5: Extent of preparedness

[N=30]
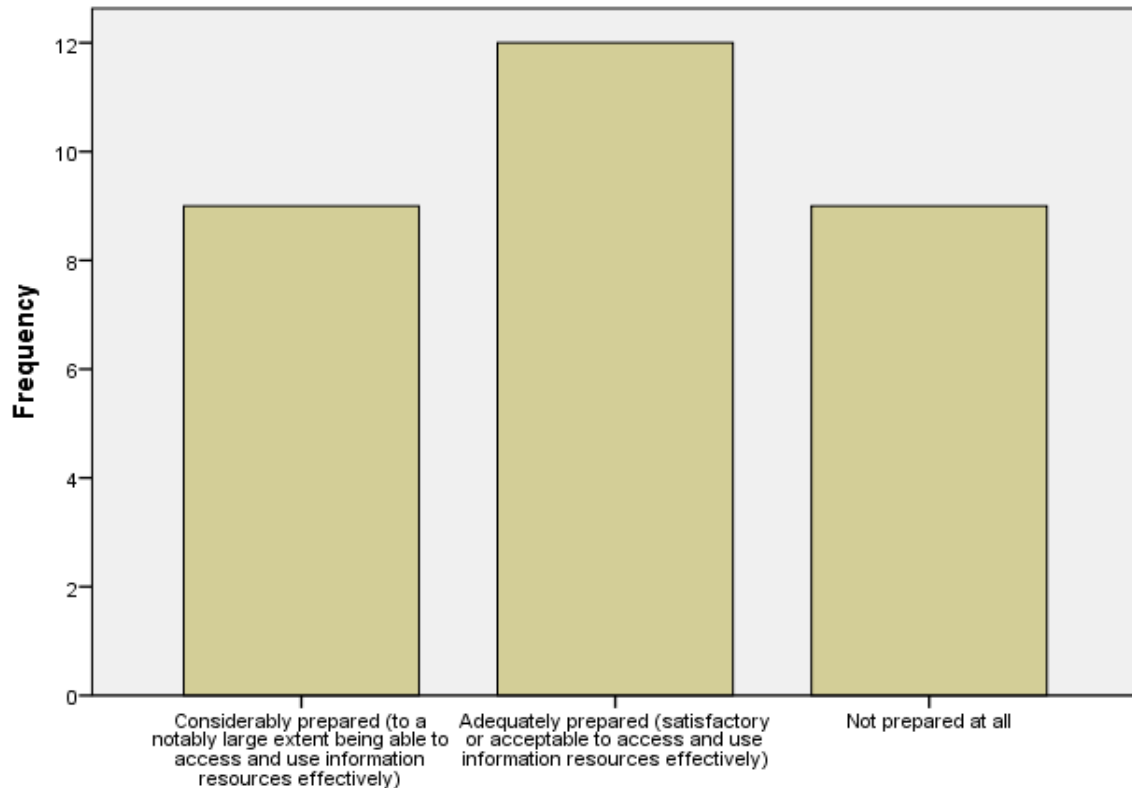
4.3.2 Level of familiarity with extent of information needed

Questions in this section were asked to determine respondent's knowledge about being able to analyse their topic and the process of creating a search strategy for an individual's research. Questions were asked to assess the students' ability to analyse a topic.

4.3.2.1 Analysis of topic keywords

Respondents were asked to select the most appropriate keywords to analyse the topic to conduct research as provided in the questionnaire. Figure 6 indicates that the majority of the respondents, 22 (73%) were unable to identify the keywords when conducting topic analysis whilst eight (27%) of the respondents were able to identify the keywords when conducting topic analysis.

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Figure 6: Analysis of topic – keywords

[N=30]
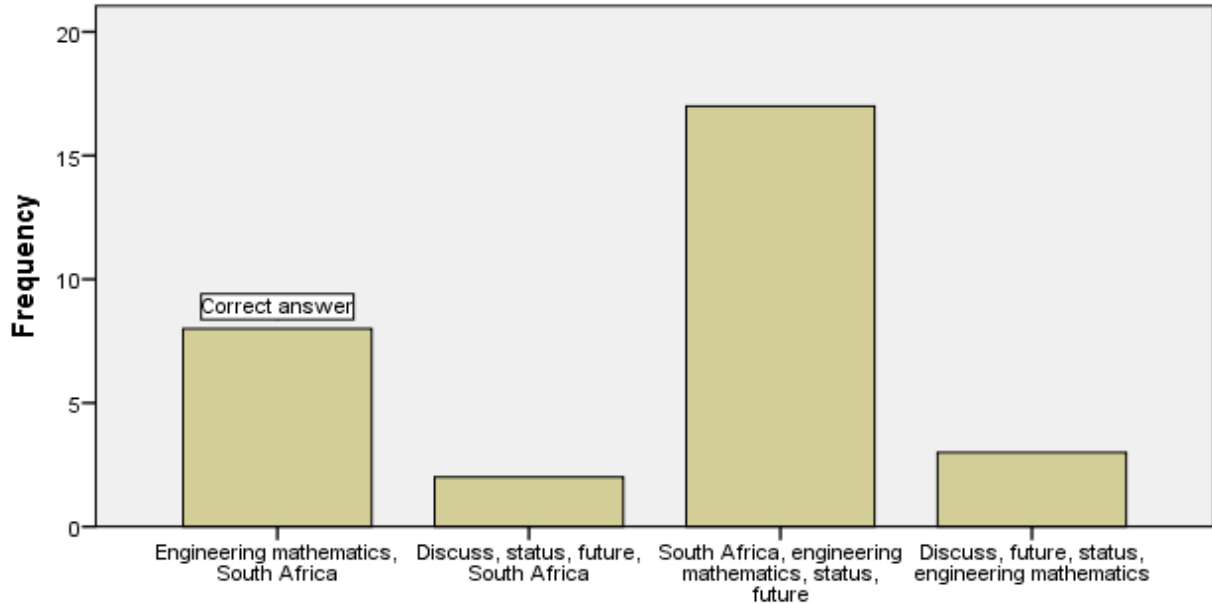
4.3.2.2 Analysis of topic –search strategy

Question 7 ascertained whether respondents were able to identify synonyms or alternate keywords/concepts as one of the key functions when forming a search strategy before conducting research. Although the question did not stipulate that one could select more than one answer some respondents did so. Thus the total percentage in Figure 7 is more than 100%. Eleven (37%) of the respondents indicated that they locate books using the DUT library's online catalogue or discovery tool (Summon) as part of forming a search strategy. Six (20%) of the respondents indicated that they search a computer database for articles. Eleven (37%) of the respondents indicated that they analyse the topic to identify synonyms or alternate keywords/concepts as part of forming a search strategy. Ten (33%) of the respondents indicated that they check the Internet for background information on a topic as part of forming a search strategy.

[N=38]

4.3.2.3 Analysis of topic - broaden and narrow search

Respondents were asked to indicate their understanding of forming a search strategy when conducting research. Figure 8 illustrates that 12 (40%) of respondents were able to start with a broad overview and then narrow the search to more specific sources whilst 60% did not demonstrate a clear understanding of topic analysis. This 60% consisted of 7 (23%) respondents using books as their initial source of information whilst 9 (30%) of respondents used research articles as their initial source of information and a small minority of 2 (7%) of respondents used encyclopaedias as their starting point.

4.3.3 Level of familiarity of accessing information

Questions in this section were asked to determine the respondents' knowledge about being able to access credible information seamlessly and effectively when conducting research. Questions were asked to assess students' ability in finding credible academic information using the most appropriate sources and search strategies.

4.3.3.1 DUT library collection

Respondents were asked to indicate which source they would use to locate books at the DUT library. Nineteen (63%) respondents stated that they would use the DUT library online catalogue to locate books at the DUT library whilst 11 (37%) of student indicated that they would use Summon (discovery tool) and the DUT library online catalogue to

locate books at the DUT library. Nineteen (63%) of respondents whom stated that they would use the DUT library online catalogue to locate books at the DUT library, although not categorically incorrect, it is not the most appropriate response, since Summon (discovery tool) and the DUT library online catalogue can both be accessed to locate books from the DUT library.

Figure 9: DUT library collection

[N=30]
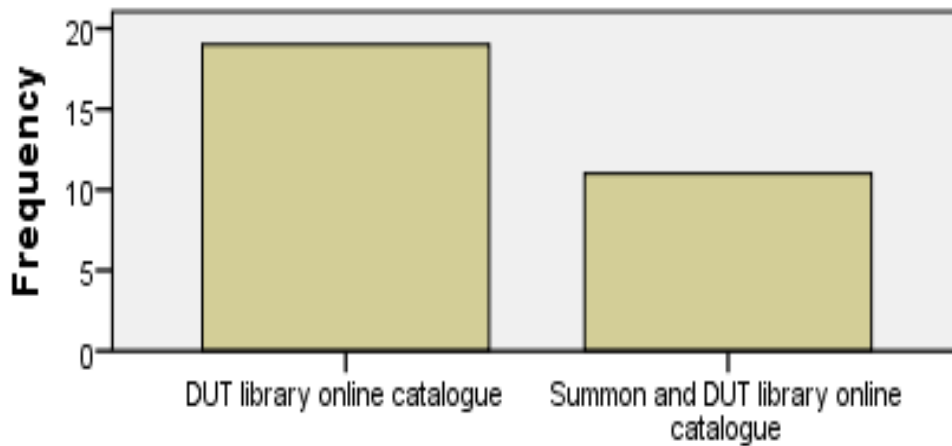
4.3.3.2 DUT library catalogue

This question allowed respondents to select more than one option as an answer. Of the 30 respondents who responded to Question 10 which examined how respondents optimised searching the DUT library catalogue, two (6%) respondents indicated that they would use a different computer terminal if they typed in the word engineering design and it did not produce any search results whilst 4 (11%) indicated they would go to a different library or surf the Web. However there were respondents who did show an understanding of being able to produce the necessary search results by selecting the most appropriate answers. This comprised of 14 (39%) of respondents who specified being able to identify a synonym for engineering design whilst 16 (44%) indicated that they would put quotes around the phrase "engineering design".

Figure 10: DUT library catalogue

[N=30]

.
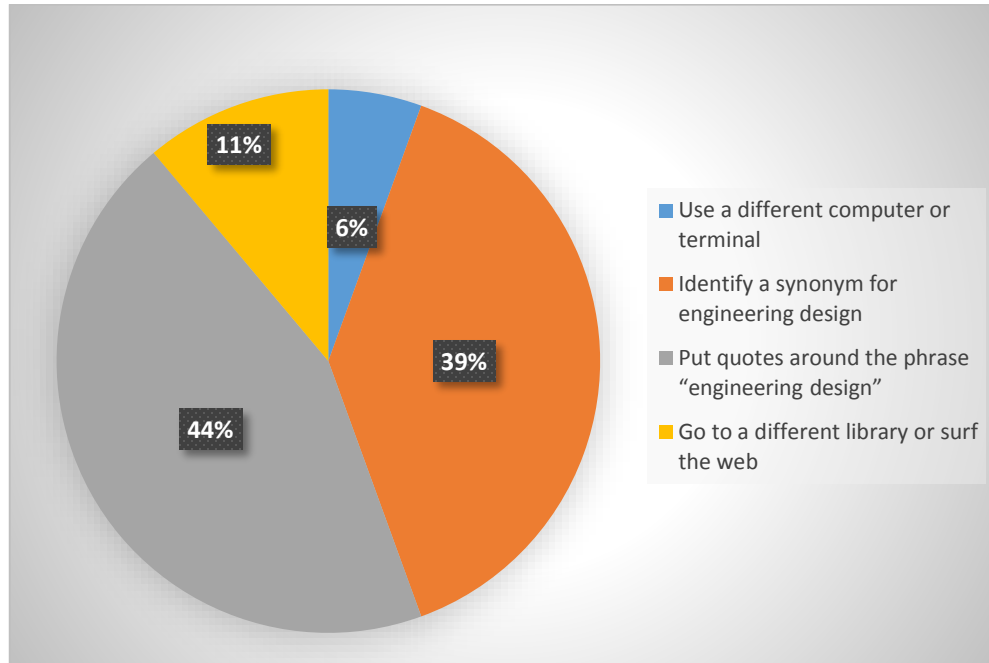
4.3.3.3 Boolean operators

Question 11 explored whether respondents were able to use boolean operators in narrowing or broadening their search results. Respondents had to identify which boolean operator to use to broaden their search results. Figure 11 indicates that eight (27%) stated that they would use the "OR" boolean operator to broaden the number of the sources when searching an academic database. A significant number of respondents, 20 (67%), did not know which was the most appropriate boolean operator to use when broadening your search. Two (6%) of the respondents did not answer the question. This illustrates that respondents are either unfamiliar with the use of boolean operators or are not adequately prepared to use them to enhance their search strategies when conducting research.
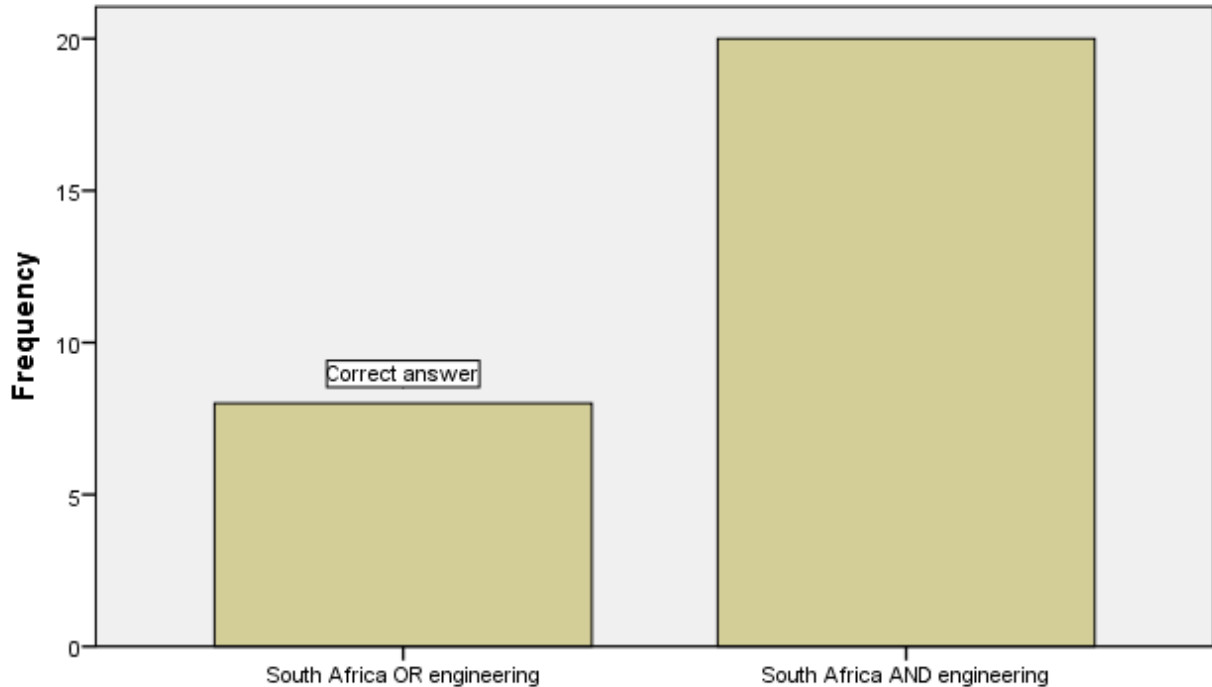
4.3.3.4 Database search

Question 12 examined whether respondents were able to ascertain what type of search results would be retrieved when conducting a search for a particular term in a database. The term for this particular question used was 'engine'. Of the 30 respondents, one (3%) indicated that if you type "engine" into a database the search results retrieved will only focus on engineering whilst a further one (3%) also specified that the results retrieved will only focus on engine control modules. Fourteen (47%) of respondents stated that if you type the word "engine" into a database search the results retrieved will contain terms such as engineering, engine control modules and engineering analysis whilst the remaining 14 (47%) indicated if you type the word "engine" into a database search the results retrieved will only retrieve articles relating to "engine". Of the 30 respondents who answered this question a combined majority of 16 (53%) of the participants were unable to identify the most appropriate search results that would be retrieved if an individual types the word "engine" into a database search.

Figure 12: Database search

[N=30]
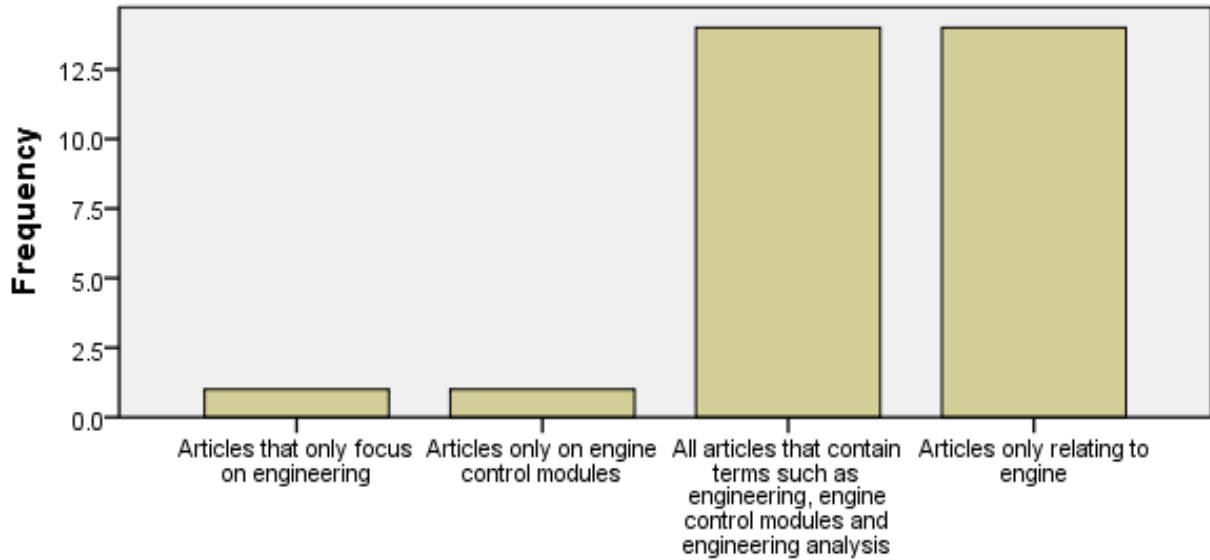
4.3.3.5 Research articles

Respondents were asked to indicate where the most appropriate place to find research articles is by scholars, experts or professionals. Of the 30 respondents who responded to this question 2, two (7%) indicated that they would use amazon.com to find such articles whilst 28 (93%) of respondents stated that they would use scholarly journals to find research articles.

Figure 13: Research articles

[N=30]
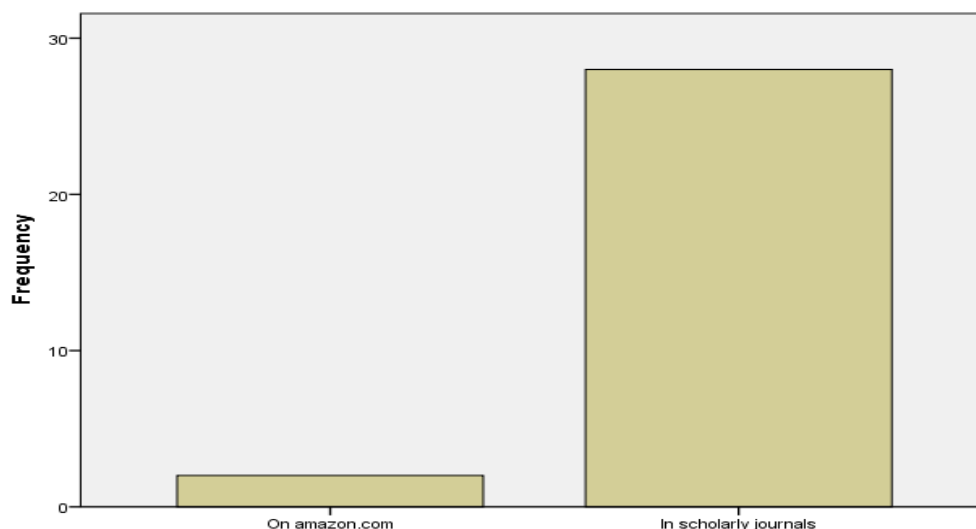
4.3.4 Level of experience in evaluating information and its sources critically

Questions in this section were asked to determine the respondents' knowledge about being able to evaluate information and sources used for research critically. The questions chosen were based on the understanding of a respondent's use of websites for research purposes.

4.3.4.1 Authority (expert) in a specified field e.g. engineering thermodynamics

This question allowed respondents to select more than one option as an answer. Thus the total percentage in Figure 14 is more than 100%. Of the 30 respondents who answered Question 14 which scrutinized how respondents identified if someone is an authority on engineering thermodynamics, three percent indicated that you would know if an individual is an authority if they had their own website whilst a further three percent indicated the individual is an authority on engineering thermodynamics when they use technical jargon that most readers don't understand. Eight (27%) indicated an individual is an authority if the person has a PhD in engineering thermodynamics. A significant combined large majority of 47 (79%) were able to assess if an individual is an authority on engineering thermodynamics. This large majority comprised of 24 (80%) respondents indicating that an individual is an authority on engineering thermodynamics when numerous articles on

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engineering thermodynamics cite the individuals work whilst 23 (77%) respondents stating that an individual is an authority on engineering thermodynamics if the individual has published extensively in the field.

Figure 14: Authority (expert) in a specified field

[N=57]
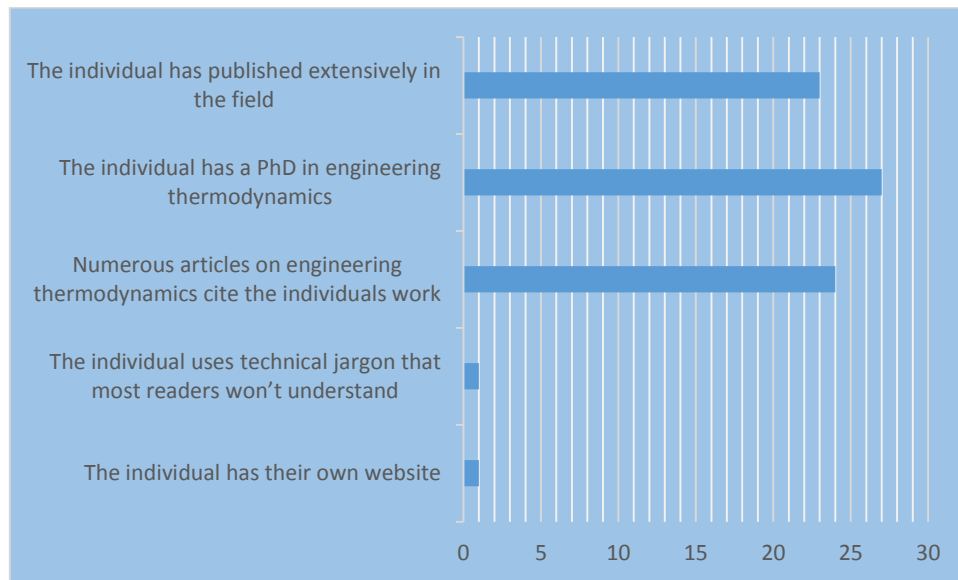
4.3.4.2 Evaluating a website

Question 15 explored if respondents were able to evaluate a website. This is an important skill since information is primarily gathered from online resources for research. Although the question did not stipulate the selection of more than one answer, some respondents' selected more than one response and therefore the total percentage in Figure 15 is more than 100%. Respondents were asked to indicate the primary purpose of the Engineering Council of South Africa website. Two (7%) indicated that the primary purpose of the Engineering Council of South Africa website is to present personal opinions on engineering matters to South Africans engineers. Twenty one (70%) indicated that the primary purpose of the Engineering Council of South Africa is the accreditation of engineering programmes, registration of persons as professionals in specified categories and the regulation of the practice of registered persons whilst 10 (33%) indicated that the primary purpose of the Engineering Council of South Africa is to provide information on issues such as accreditation of engineering programmes for tertiary institutions, membership, regulations

of engineering practice etc. A large majority 21(70%) of respondents were therefore able to demonstrate an understanding of evaluating a website.

Figure 15: Evaluating a website

[N=30]
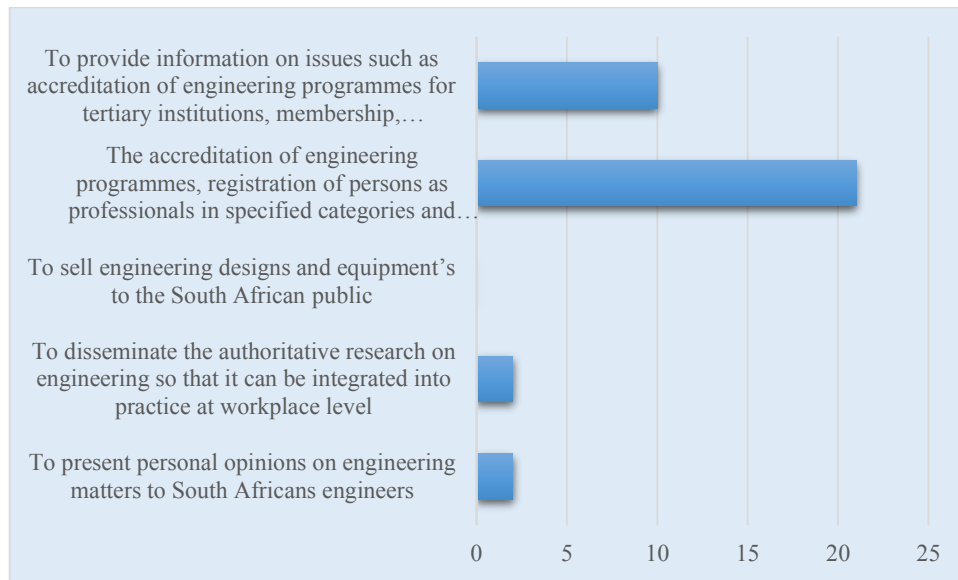
4.3.4.3 Evaluating information sources

Question 16 examined whether respondents were able to critically evaluate information sources when searching for information. This question did not stipulate you can select more than one answer, however, some respondent's selected more than one response. Thus the total percentage in Figure 16 is more than 100%. Figure 16 illustrates that two (7%) of the respondents selected the currency of the information as the most appropriate response when critically evaluating information sources whilst three (10%) indicated the credentials of the author as the most appropriate response when critically evaluation information sources. A further eight (27%) of the respondents stated that the relevancy of the information source as the most appropriate response when critically evaluating information sources, whilst six (20%) specified the accuracy of the information as the most appropriate response when critically evaluating information sources. However a majority of 19 (63%) of respondents indicated that the criteria of currency of the information, credentials of the author, relevancy of the information source and accuracy of the information are all important components when critically evaluating information sources.

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Figure 16: Evaluating information sources

[N=30]
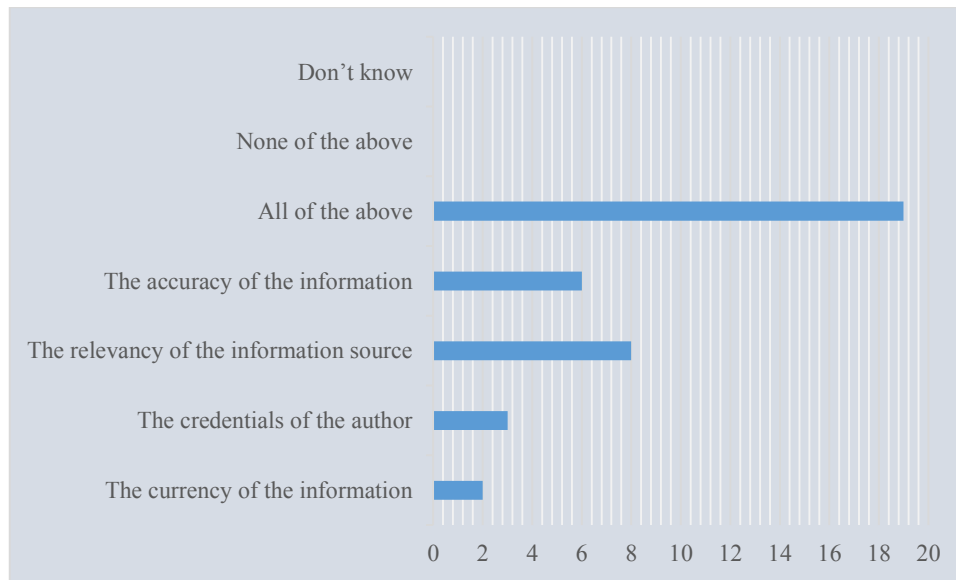
4.3.5 Level of experience in incorporating selected information into one's knowledge base

Questions in this section were asked to determine the respondents' knowledge about being able to incorporate selected information into one's knowledge base. The questions chosen were based on the understanding of the respondents' use of journals for academic research.

4.3.5.1 Academic value of a research work

The intention of question 17 was to explore if respondents were able to differentiate an academic peer reviewed publication from a piece of work that did not have the value of a peer reviewed resource. One (3%) respondent defined a peer reviewed publication as a system of revision carried out by the South African Department of Education under the supervision of the relevant authorities in education whilst six (20%) of respondents understood a peer reviewed publication as a process of guaranteeing that all articles are hundred percent true by having experts read them before they are published. It is noteworthy to state that 23 (77%) of the respondents had a clear understanding of peer reviewed as being publications that have been evaluated by several researchers/subject specialist with credentials in the field related to the publication or in the academic community prior to it being accepted for publishing.

Figure 17: Academic value of a research work

[N=30]
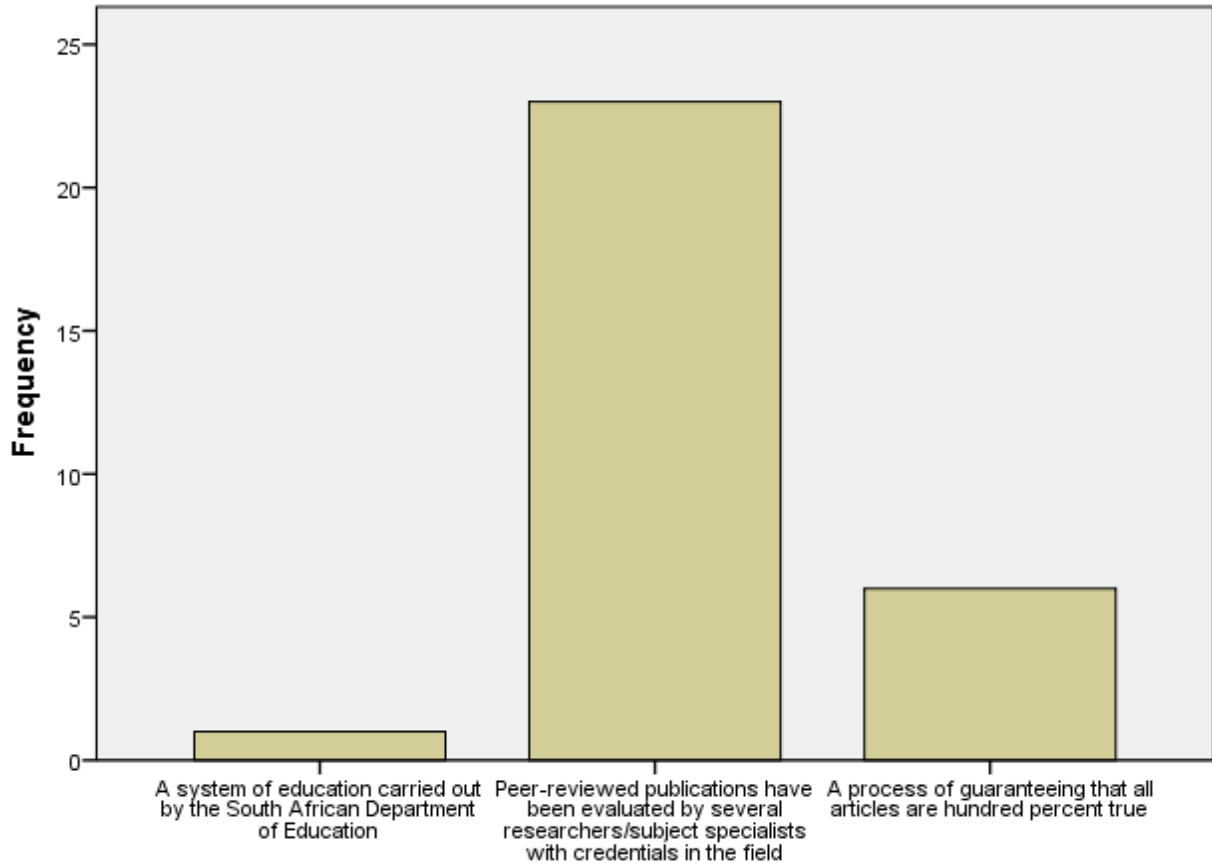
4.3.5.2 Level of experience in incorporating selected information into one's knowledge base (referencing)

The outcomes of questions 18, 19 and 20 were to determine whether respondents were able to assess and correctly extract the necessary information required to reference a piece of work for academic research. Respondents were provided with a referenced journal article from which they had to identify the title of the journal, title of the article and the volume number.

4.3.5.3 Title of the journal

The result from question 18, which was to identify the title of the journal, showed that two (7%) of respondents indicated that "Wind turbine condition" monitoring as the title of the journal whilst a further two (7%) of the respondents indicated that "Wind turbine condition

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monitoring: a scholarly perspective" as being the title of the journal. A significant majority of 26 (86%) of respondents indicated "Wind energy" as being the title of the journal which was the correct response to the question.

Figure 18: Title of the journal

[N=30]
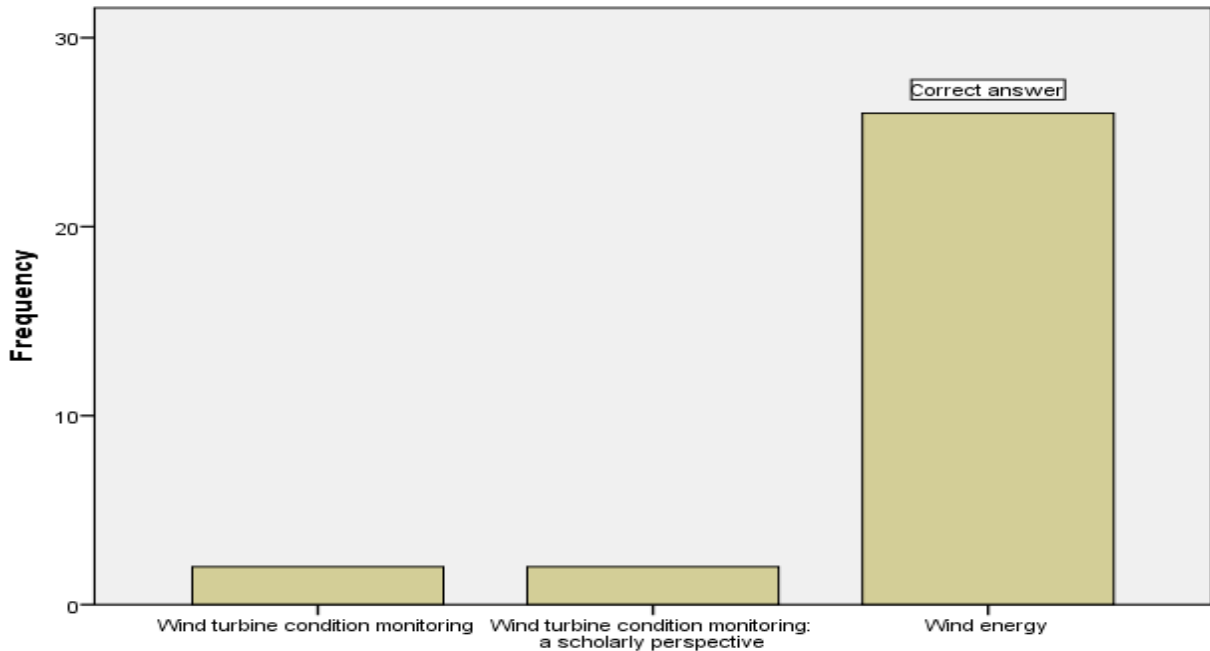
4.3.5.4 Title of the article

Respondents were asked to indicate the title of the article for the example provided. Two (7%) of respondents indicated that "Wind energy" as the title of the article, whilst a further two (7%) of respondents indicated that "Wind turbine condition monitoring" as being the title of the article. One (3%) respondent indicated that "a scholar perspective" as being the title of the article. A substantial majority of 25 (83%) of respondents indicated that "Wind turbine condition monitoring: a scholarly perspective" as being the title of the article which was the correct response to the question.

Figure 19: Title of the article

[N=30]
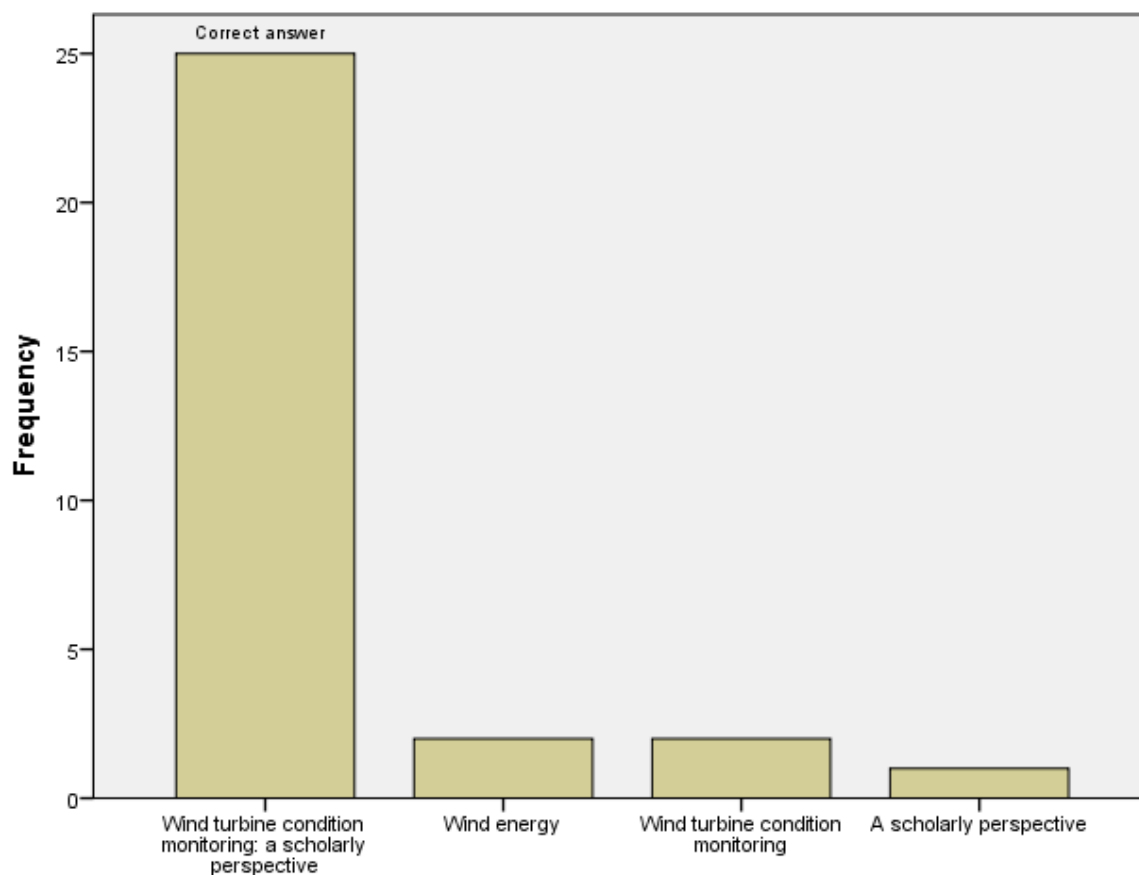
4.3.5.5 Volume number of the journal

Respondents were asked to indicate the volume number for the example provided. Figure 20 illustrates that 21 (70%) of respondents were able to indicate the volume number of the journal whilst 30% did not demonstrate a clear understanding of being able to specify the volume number of the journal. This 30% comprised of seven (23%) respondents describing the issue number of the journal as the volume number whilst a small minority of two (7%) of respondents using the page number of the journal and describing it as the volume number.
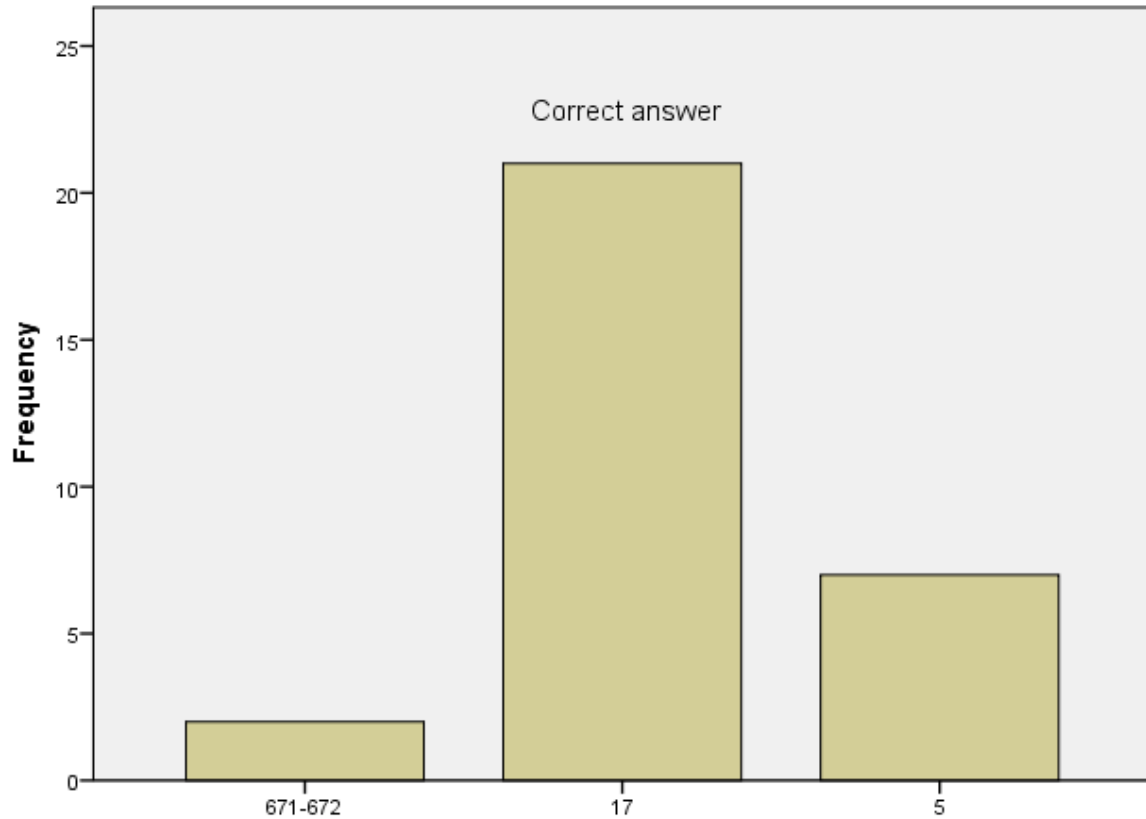
4.3.6 Level of experience in using information effectively to accomplish a specific purpose

Questions in this section were asked to determine the respondents' understanding of using information effectively to accomplish a specific purpose. The topic of referencing was used as an example to examine and assess the information literacy skills of respondents in understanding referencing when conducting research at postgraduate levels.

4.3.6.1 Referencing

Respondents were asked to indicate their understanding of the Harvard style of referencing and what it signifies when conducting research. Two (7%) of respondents specified that the Harvard style of referencing is a library classification system whilst two (7%) also stated

that the Harvard style of referencing are article indexes. A large majority of 26 (86%) respondents indicated that the Harvard style of referencing is a format to document sources used for a research paper which was the accurate response to the question.

Figure 21: Referencing

[N=30]
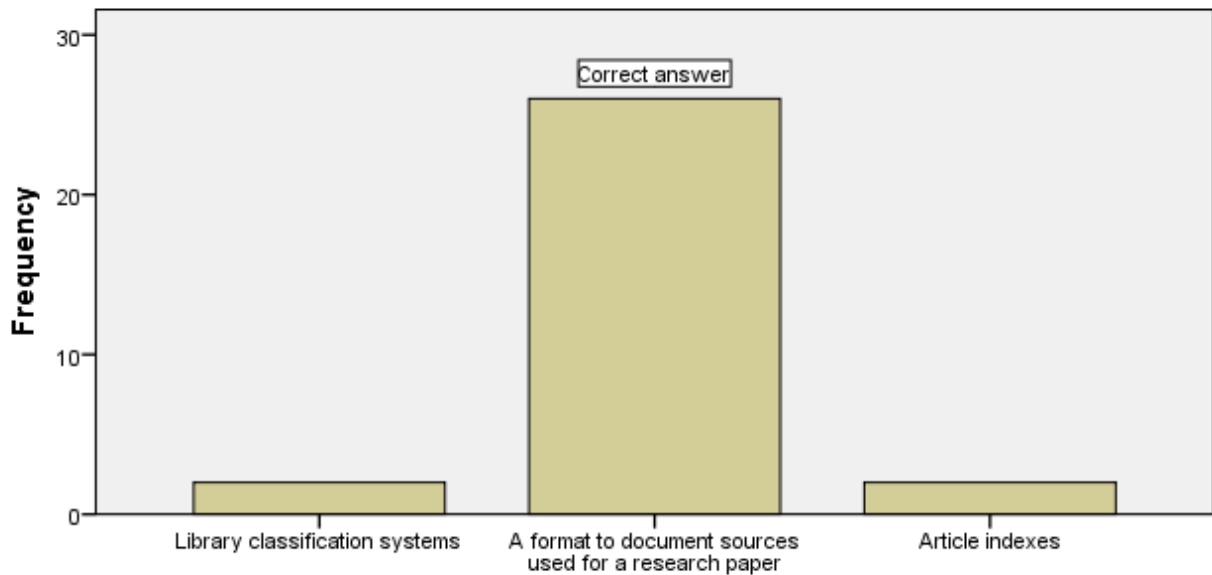
4.3.6.2 Reference list

Respondents were asked to indicate their understanding of a reference list which is a requirement when conducting research at postgraduate level. Of the 30 respondents who responded to this question 16 (53%) showed that they understood what a reference list is by indicating that it is a list of the academic sources referred to in a scholarly work, typically printed as an appendix. A considerable combined number of 14 (47%) of the respondents did not display a clear understanding of a reference list. These 14 (47%) respondents comprised 13 (43%) who indicated that a reference list is a list of sources used in preparing a paper and one (3%) who stated that a reference list is an outline of the article.

[N=30]
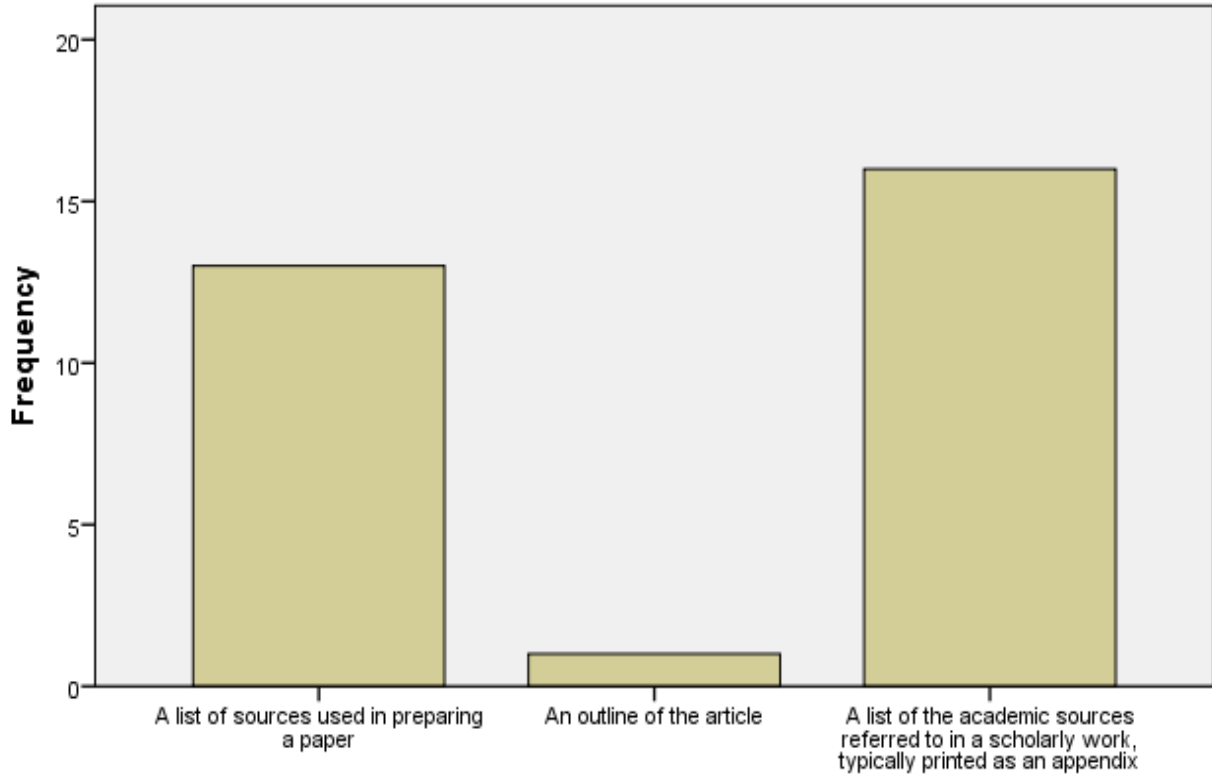
4.3.6.3 Citations

This question allowed respondents to select more than one option as an answer and therefore the total percentage in Figure 7 is more than 100%. Although all the options provided were correct for respondents to answer most correctly they had to select all the choices stipulated in the question. Figure 23 illustrates that 16 (53%) of respondents indicated that citations allow an individual to locate and read the sources required when conducting research whilst 15 (50%) of respondents specified that citations give credit to the author. A further 23 (77%) of respondents stated that citations allow readers to determine the credibility of sources when conducting research whilst 22 (73%) of respondents indicated that citations should be included in an individual's research to avoid plagiarism. Only 10 (33%) of respondents selected all the options for this question.
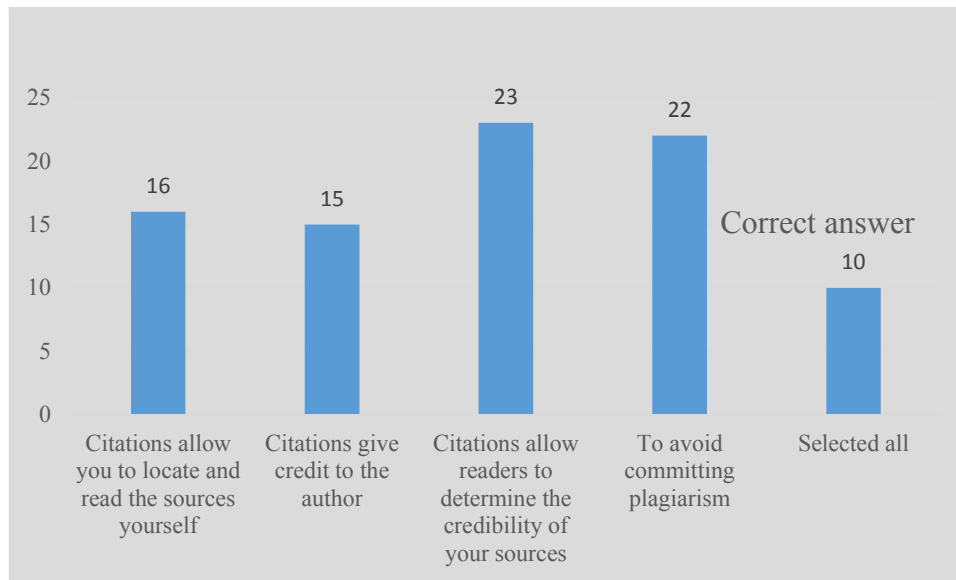
4.3.7 Level of experience in understanding the legal and ethical use of information

Questions in this section were asked to determine the respondents' understanding of many of the economic, legal and social issues surrounding the use of information including accessing and using information legally and ethically. The outcome of this section was based on ascertaining and assessing whether the respondents were able to demonstrate an understanding of intellectual property, copyright and the fair use of copyrighted material when conducting postgraduate research.

4.3.7.1 Inappropriate use of information

Respondents were asked in Question 24 to indicate whether copying text from a website without identifying the source is regarded as plagiarism. One (3%) of the respondents indicated that copying text from a website without identifying the source is acceptable because everyone does it whilst a second respondent also stated that copying text from a website without identifying the source is a copyright violation. A large majority of 28 (93%) respondents specified that copying text from a website without identifying the source is plagiarism.

Figure 24: Inappropriate use of information

[N=30]
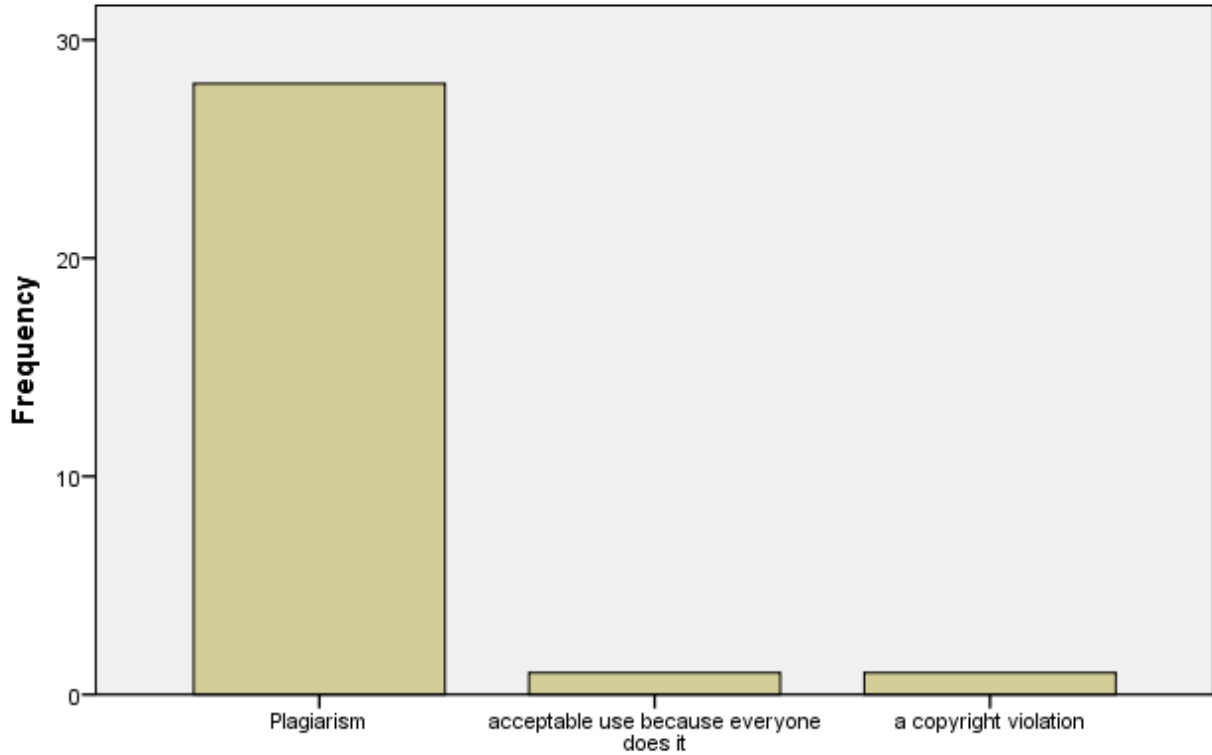
4.3.7.2 Protection by law for an individual's work

Respondents were asked to indicate what concept makes it is legally wrong to reproduce a substantial portion of the work of another person without permission. Out of 30 respondents 29 (97%) indicated that the concept of copyright makes it is legally wrong to reproduce a substantial portion of the work of another person without permission whilst one (3%) did not respond to the question.
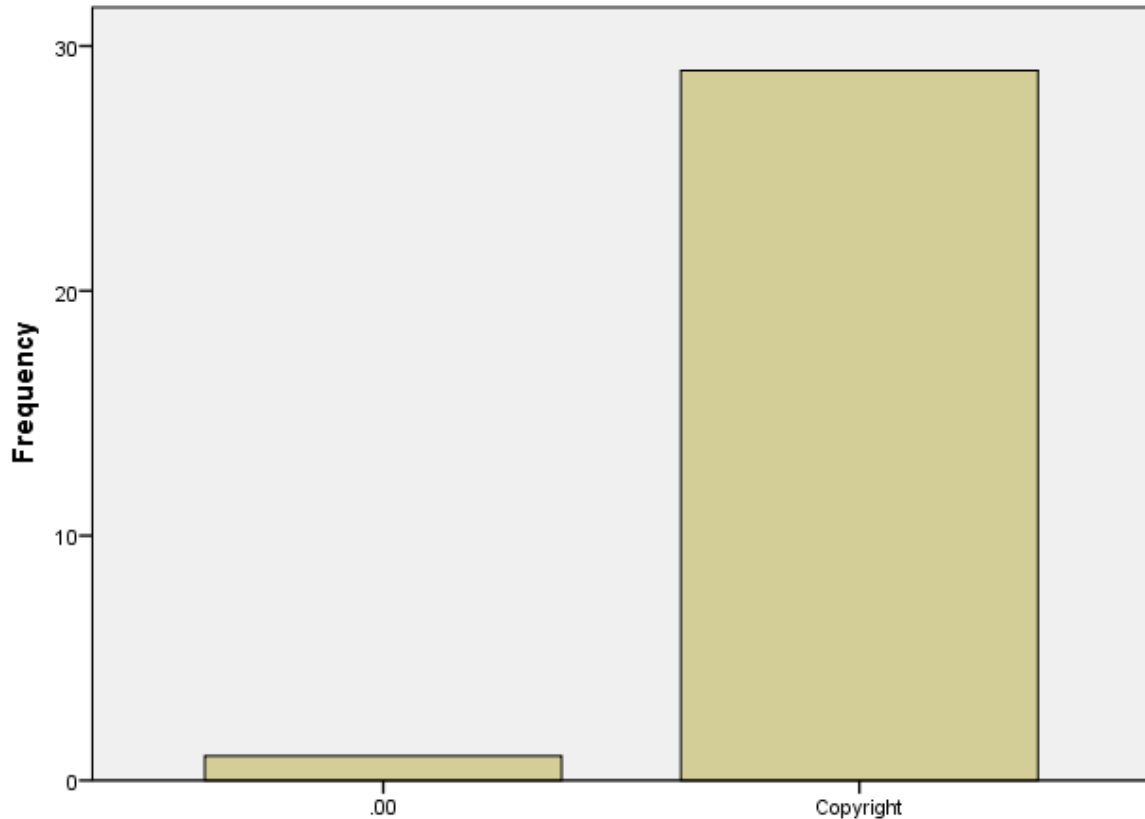
4.3.7.3 Protection by law for a work produced

Question 26 examined whether respondents were able to select the different formats of intellectual property covered by copyright law. Although the question did not stipulate that one could select more than one answer some respondents did so. Thus the total percentage in Figure 26 is more than 100%. A considerable combined number of 20 (67%) of respondents did not display a clear understanding of the different formats of intellectual property protected by copyright law. Figure 26 illustrates that three (10%) of the respondents indicated architecture as being the only intellectual property protected by copyright law whilst five (17%) responded by stating that only computer programmes were the only intellectual property protected by copyright law. Four (13%) respondents indicated that only movies were the only intellectual property protected by copyright law whilst five (17%) of respondents specified that songs were the only intellectual property protected by

copyright law. A further three (10%) of respondents indicated that some of the formats such as architecture, movies and songs were the only intellectual property protected by copyright law. However 20 (67%) of respondents did specify that all the formats listed are protected by copyright law. The varied responses by respondents could be attributed to them having a lack of understanding of what different formats of intellectual property are and the legal implications that can be imposed on an individual in violation of copyright when conducting research at postgraduate levels.

Figure 26: Protection by law for an individual's work

[N=30]
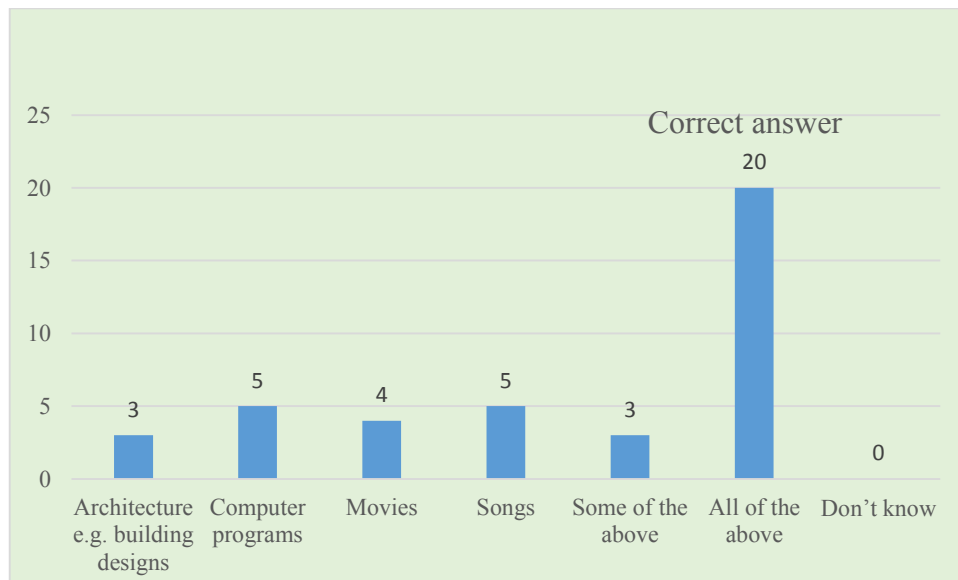
4.4 Presentation of findings of interview with postgraduate librarians

This section presents the findings of the interviews with the two DUT postgraduate librarians. The open-ended responses were contextually analysed and data was grouped into themes or concepts, where possible.

4.4.1 Current designation

The interviewees were asked what their designation was. The respondents indicated this to be postgraduate librarians at the DUT. Respondent A indicated that she is responsible for research support for the Faculties of Engineering, Health and Applied Sciences. Respondent

B conferred that she is responsible for the Faculties of Accounting and Informatics, Art and Design including the Management Sciences. Further, respondent B commented that prior to being responsible for the Faculties of Accounting and Informatics, Art and Design and the Management Sciences she was responsible for the Faculties of Engineering, Health and Applied Sciences.

4.4.2 Academic qualifications relating to role of postgraduate librarian

The interviewees were asked to outline their academic qualifications that were relevant to the role of postgraduate librarianship at the DUT. Respondent A indicated that she has a Master's degree in Digital Media and her prior qualifications were library science qualifications whilst respondent B indicated that her most current qualification is a Master's degree in Information Science.

4.4.3 Year in which respondents became postgraduate librarians

The interviewees were asked to provide the year of assuming the role of postgraduate librarians at the DUT. Respondent A indicated that she was employed as the postgraduate librarian in 2012 whilst respondent B indicated that she was employed as postgraduate librarian in 2009 at the DUT. Respondent A has therefore been employed as the postgraduate librarian at the DUT for three years whilst respondent B has been employed as the postgraduate librarian at the DUT for six years.

4.4.4 Information literacy experience

The interviewees were asked whether, outside their current roles as postgraduate librarians, they had any other experience relating to information literacy. Respondent A indicated that she had twelve years of experience relating to information literacy supporting the research needs of undergraduate and postgraduate students including academic staff for the Faculty of Engineering at another higher education institution prior to being employed at DUT. Respondent B answered that she had fifteen years of experience relating to information literacy supporting the research needs of undergraduate and postgraduate students including academic staff at another higher education institution prior to being employed at DUT.

4.4.5 Information literacy and higher education institutions in South Africa

The postgraduate librarians were asked about their understanding of information literacy in the current South African higher education context. Respondent A emphasized the

importance of information literacy in education particularly for a higher education institution in preparing students for the workplace. Respondent A further articulated students need to engage in lifelong learning so that they can find information easily and keep themselves updated on current practices within their respective industries, supporting their research, professional and developmental needs. Respondent B's understanding of information literacy within the current South African context is based upon her experience and observations at DUT and other higher education institutions. Respondent B perceives that undergraduate students lack information literacy skills and the deficiencies in information literacy skills is still evident as students' progress into postgraduate levels of their studies.

4.4.6 Information literacy and school education

The interviewees were asked whether they believe that the gap in information literacy is as a result of a lack of emphasis at school level. Respondent A indicated that at school level she is not involved with students and therefore does not know how they are engaging with their learners however she did stipulate that the information environment is ever-changing. She stated that how we access resources and how we find information is always radically changing. In contrast respondent B specified that first year undergraduate students lack information literacy skills. Respondent B believes this is due to the fact that the schools are not preparing students enough for tertiary education and this has an impact on their information literacy skills. Respondent B also stated that the lack of information literacy skills at school is mainly because of the lack of facilities and resources to access and use information.

4.4.7 Information literacy skills of undergraduate students at the DUT

The postgraduate librarians were questioned concerning the lack of information literacy skills of undergraduate students. Respondent A agreed with the interviewer that students do lack information literacy skills at undergraduate levels. However, she did highlight that if students do lack information literacy skills they need to develop their skills. She further explained that if they do have information literacy skills they need to enhance and expand these skills keeping themselves updated. Respondent B shared similar sentiments as respondent A and also indicated that students at undergraduate levels lacked information literacy skills.

4.4.8 Information literacy skills of postgraduate students at the DUT

The interviewees were asked whether they experience this pattern or trend of students lacking information literacy skills at postgraduate level. According to respondent A at postgraduate level there is a diverse group of students. Some students come through undergraduate studies engaging with research. These students have an understanding of research methodology and how to find information. Although they may not have advanced information literacy skills they have a foundation of understanding in terms of information literacy skills. However this does not apply to all students at undergraduate level. The other type of student that pursues postgraduate studies according to respondent A is the students returning after many years to study from the working environment. These students need a lot of support and assistance to develop their information literacy skills. Respondent B shared the same sentiments as respondent A that students returning to pursue their postgraduate studies after many years require additional support to develop their information literacy skills whereas students who had been within the undergraduate programmes have certainly had a foundation of understanding in terms of information literacy skills. Respondent B further pointed out that that these students who return to research after many years usually have problems in grasping information literacy skills initially. They have a tendency to attend the same information literacy training initiative to better understand how to find and use information for their research. This can be proven by the evaluation forms that are provided for students by the postgraduate librarians during information literacy training.

4.4.9 The lack of information literacy skills in specific areas

The postgraduate librarians were questioned concerning the lack of information literacy in specific areas for students at postgraduate levels. Respondent A indicated student's inability to search for information of academic value and integrity is a critical area. She expanded by stating that postgraduate students lack topic analysis skills. Postgraduate librarians have to spend time in this area helping them understand that how to identify and search using keywords including suitable searching strategies with the option to refine searches. Further she remarked that students need to understand that the type of information they use must be scholarly and academic. They also have to be able to evaluate information and use it responsibly. This includes being able to acknowledge and reference information used.

Lastly she commented that students at postgraduate level lack referencing skills. Respondent B addressed similar issues in her response to the interviewer indicating that postgraduate students lack the ability to find credible information for research. She pointed out that there is a lack of understanding as to how to evaluate information including the use of information. Respondent B also observed that students found it difficult to acknowledge and reference information used.

4.4.10 Information literacy objectives at the DUT

The respondents were asked about the current information literacy objectives at the DUT and whether there were being met. Respondent A answered in terms of the postgraduate information literacy objectives at the DUT. She remarked that they still have a long way to meet objectives in terms of information literacy and the postgraduate librarian portfolio. However in the past three years the amount of training covered by the postgraduate librarians has increased significantly which means there is a demand for information literacy training at postgraduate level and there is value in these postgraduate library training initiatives. This can be supported by the postgraduate survey done during the second semester of 2014 that suggested that the services being offered have value for the students and they are finding them very helpful. Respondent B in her comments to the interviewer remarked that to a certain degree the information literacy objectives are being met but until information literacy does become compulsory not every student will attend. She stated that there is indefinitely a problem with attendance stemming from undergraduate levels. This trend continues at postgraduate levels. The impact of this according to respondent B is that students often find it difficult in making the transition into postgraduate research as they lack key information literacy skills. She believes if information literacy becomes compulsory it will improve students' information literacy skills as they develop from undergraduate to postgraduate levels. This will help students in that the information literacy training will not be as intense when they reach postgraduate levels of their study. Further respondent B believes embedding and integrating information literacy into the curriculum from undergraduate level will help to alleviate the problem of students lacking in information literacy skills as students will have to attend. She also indicated that there should be an assessment to go with the embedding or integration of information literacy into the curriculum.

4.4.11 Information literacy instructional design for postgraduate students at the DUT

The respondents were asked whether the information literacy instruction design caters for the research support as required by postgraduate students. Respondent A commented that the postgraduate librarians have recently used the ACRL standards and developed five lesson plans. She further stated that this was a platform for the postgraduate librarians to expand on. Respondent A indicated that the postgraduate librarians were going to use this as a guide from 2015. She further remarked that during the past three years the postgraduate librarians have been very flexible in how they have developed lessons an training sessions but have now selected a model (ACRL) to develop the information literacy outcomes and objectives. Respondent B shared the same sentiments as respondent A. She indicated that although there is no formal information literacy instructional design currently for postgraduate students there is a work in progress. Respondent B further stated that the postgraduate librarians do have an outline of an instructional design but they have not actioned it as yet. Respondent B also commented that an information literacy instructional design for the postgraduate librarians would be helpful. Lastly respondent B mentioned that in creating this information literacy instructional design it would be helpful for investigating best practices. This can act as a support mechanism in bridging the gap and making it easier for students at postgraduate levels at the DUT.

4.4.12 Summary

In this chapter the findings of the study were presented in a graphical and contextual format. Headings used to structure this chapter were the ones used in the actual questionnaire. In Chapter five the above findings are discussed.

Chapter five: Discussion of the results

5.1 Introduction

The results of the study are discussed in this chapter. The purpose of this study was to investigate the information literacy skills of postgraduate engineering students at the Durban University of Technology (DUT). The results of the study are discussed in light of the research questions posed in Chapter one:

- What information literacy skills do postgraduate engineering students bring from their undergraduate studies at the DUT?
- What are the major challenges postgraduate engineering students experience in learning and applying information literacy skills?
- How can information literacy skills be enhanced amongst postgraduate engineering students?

5.1.1 Population and response rate

The population for this study was 80 postgraduate engineering students and the two postgraduate librarians from the DUT library. Questionnaires were distributed to postgraduate engineering students and interviews were arranged and conducted with the postgraduate librarians. The response rate for this study was within the range of an acceptable number of respondents in terms of the questionnaires administered – out of 80 postgraduate students identified and approached, 30 (38%) responded. This can be supported by Baruch and Holtom (2008) who states that "recently published research suggests a benchmark of approximately 35–40 percent" as an acceptable response rate in an organization when conducting research. However, according to Johnson and Wislar (2012: 1805) there is no scientifically proven acceptable response rate. Thus, for the purpose of this study the researcher decided to apply Baruch and Holtom (2008) approach to understanding the population and response rate.

5.1.2 Discussion relating to higher education and information literacy of postgraduate students at DUT

This section discusses the following variables: race, level of postgraduate study, level of information literacy instruction and extent of preparedness for postgraduate research in terms of being able to effectively access and use the information resources at the DUT library.

5.1.2.1 Race

The South African population demographically consist of people of African origin as the largest race group comparatively to other populations in South Africa. This could account for the fact that more than half (53%) of the respondents in this study were of African origin. The high percentage of Indians registered for postgraduate studies in engineering courses at DUT such as Civil Engineering, Chemical Engineering, Mechanical Engineering and others as reflected in this study, could be attributed to Kwazulu-Natal and Durban, having the highest population of Indians in South Africa. The DUT, through historical and political evolution, is a previously disadvantaged higher education institution and the results of this study show that the students who participated were predominantly from African and Indian race groups.

5.1.2.2 Level of postgraduate study

The majority of the respondents (73%) were in Masters programmes while the remaining 27% were involved in Doctoral studies within the Faculty of Engineering. There were no respondents conducting any form of post-doctoral studies within the engineering programmes.

5.1.2.3 Level of information literacy instruction at undergraduate level

Questions 3 and 4 sought to explore whether respondents attended information literacy at undergraduate levels of their studies. In terms of question 3, 27% of respondents stated that they did attend information literacy instruction whilst 70% indicated that they did not attend such instruction during their undergraduate studies at DUT. The remaining respondent was unsure whether or not they attended information literacy instruction at DUT. Question 4 was directed at students attending information literacy at undergraduate level at any other institution. Of the 30 respondents, 63% indicated that they did not attend information literacy instruction at any other institution. The results show that most students from the

Faculty of Engineering at DUT did not attend undergraduate information literacy instruction at DUT or at another institution. The lack of attending information literacy at undergraduate levels of study is not applicable to DUT only. Latham and Gross (2013) in their study found that students are completing their undergraduate study without the necessary information literacy skills needed for successful postgraduate study or for lifelong learning because of poor attendance at information literacy training initiatives during their undergraduate levels of study.

5.1.2.4 Extent of preparedness

The researcher assessed postgraduate students' understanding of how prepared they were for conducting research in terms of effectively accessing and using the information resources available via the DUT library. It was interesting to note that a significant majority (70%) of respondents indicated that they were considerably or adequately prepared to do so. Respondents therefore assumed that while they did not attend information literacy as indicated in questions 3 and 4 respectively at undergraduate level that they had adequate information literacy skills to conduct their research at postgraduate levels of their study. This perception of being able to effectively access and use the information resources is not limited to postgraduate students at DUT only. According to Harkins, Rodrigues and Orlov (2011: 28) it is often assumed b librarians and academics that students entering postgraduate studies are information literate, yet many of them lack the skills needed to effectively organize and critically evaluate research. Harkins, Rodrigues and Orlov (2011) elaborate that this could be attributed to respondents having a false sense of confidence without an equal understanding of information literacy and extent of preparedness, in terms of being able to effectively access and use the information resources for postgraduate research. Fleming-May and Yuro (2009) support this by stating that graduate students overestimate their information literacy skills. This trend is also ubiquitous at the DUT amongst the postgraduate engineering students. The students who participated in the study were incorrect to assume that they were considerably or adequately prepared to conduct postgraduate research. As indicated in the findings in the previous chapter and as will be discussed below, the study revealed that the engineering students often lacked the necessary skills in key areas of information literacy when conducting research.

5.2 Level of familiarity with extent of information needed (searching for information using information literacy skills)

This section assessed the ability of postgraduate students to use key information literacy skills to search for information on a research topic. These information literacy skills included analysing the topic and forming a search strategy depending on the extent of information needed.

5.2.1 Identifying the topic by analysing keywords

Respondents were presented with a topic and asked to analyse it by selecting the most appropriate keywords. Of the 30 respondents a majority of 73% were unable to identify the keywords which demonstrates that the engineering postgraduate students at the DUT lack an important information literacy skill, which is being able to identify relevant keywords that will guide them in finding information for their research. Conway (2011: 131) confirms this finding by stating that both undergraduates and postgraduates appear to have difficulty in identifying concepts from an assignment topic and translating these into keywords.

5.2.2 Forming a search strategy

Part of forming a search strategy when conducting research is to "analyse the topic to identify synonyms or alternate keywords/concepts". When questioned on this, the vast majority, 27 (90%) of the 30 respondents provided answers which missed this crucial step. Among answers ticked were "Check the Internet for background information on your topic" and "Locate books using the DUT library's online catalogue or discovery tool (Summon)". This points to the fact that student's information seeking behaviour is diverse when forming a search strategy and that traditional methods such as analysing a topic and identifying synonyms or alternate keywords/concepts are often compromised. Critz *et al.* (2012: 532) state that many students turn to Google even before forming a search strategy or using library resources which was evidently the case in the present study. The authors elaborate by stating that students prefer online resources because of the ease with which that they can access information and the timeliness by which it is made available. This is supported by Green and Macauley (2007: 322) who state that students commencing doctoral studies typically report that they begin postgraduate literature searching with search engines such as Google.

5.2.3 Analysing the topic and using reference sources

An important information literacy skill when analysing a topic for research is being able to use the reference sources available to broaden and narrow your search. This is done to demonstrate a clear understanding of searching for the relevant issues within the topic of interest. Generally, good information literacy practice would therefore be to use reference sources such as dictionaries and encyclopaedia's initially, before using other sources of information, for example, books and research articles. This can be supported by the ACRL (2000) information literacy model used for this study that indicates 'the information literate person should be able to explore information sources to increase familiarity with the topic'. The results for this study indicate that although 40% of respondents showed a clear understanding of using reference sources, a combined 60% of respondents indicated books, research articles and encyclopaedias as their starting point when analysing their topic. While it could be argued that the respondents who initially used books and articles felt that they sufficiently understood the parameters of their topic, the results indicate that respondents missed what could be considered an important step namely, ensuring a clear understanding of the topic through the use of reference sources.

5.3 Level of familiarity with accessing information

In this section, the researcher aimed to determine whether postgraduate students were able to select and use the most appropriate sources such as the DUT library catalogue, databases and scholarly journals when searching for information. The theme of accessing information for research can be broadly classified under the category, "types and formats of information" which relates to the ACRL first standard. The first standard states that the "information literate student identifies a variety of types and formats of potential sources for information." Questions 9, 10, 11, 12 and 13 examined whether respondents were able to identify and use information from reliable sources when conducting research.

5.3.1 Accessing the DUT library collection

Technology has allowed accessibility to the DUT library collection through various online library search tools. These library search tools include the online DUT library catalogue as well as the DUT library discovery tool which is known as "Summon". The discovery tool allows distinct methods of searching for different types of materials and returns results by relevance. This reduces the need for searching individual library collections such as

databases, online journals and the library catalogue. A discovery tool such as "Summon" allows an individual to search the entire collection of the library by conducting a single search. In the question respondents were asked to indicate which source they would use to locate books at the DUT library. The majority of respondents (63%) stated that they would use the DUT library online catalogue to locate books at the DUT library. Although this response is not categorically incorrect it is not the most appropriate response since Summon (the discovery tool) and the DUT library online catalogue can both be accessed to locate books from the DUT library. Thus, this suggests a lack of exposure to Summon by respondents. This can be attributed to students not having used Summon as much since its introduction in 2012 by the DUT library as opposed to their use, over many years, of the DUT library online catalogue. In this regard, Asher, Duke and Wilson (2013) assert that given the relatively recent development of discovery tools, little has been written about how the tools actually perform for users. At the time of writing Asher, Duke and Wilson (2013) were unable to identify any published user experience study comparing discovery tools such as Summon and Ebsco Discovery Service with each other, or with library databases in general.

5.3.2 DUT library catalogue

Question 10 asked respondents to decide what they would do next if searching the DUT library catalogue did not retrieve any results. Respondents were allowed to select more than one answer. A minority of postgraduate students selected the two correct responses. This demonstrated that respondents did not have a clear understanding of how to revise their search when using the DUT library catalogue. Thirty nine percent of respondents specified being able to identify a synonym for "engineering design" whilst 44% indicated that they would put quotes around the phrase "engineering design". The inability of respondents to use different strategies in retrieving information using the DUT library catalogue is an indicator that information literacy programmes held at undergraduate level which focused on teaching and demonstrating to students how to use the catalogue needs to be addressed. This could have been a reason, in part, for students being inefficient in this regard. This can be supported by a recent study by Thanuskodi (2012:234) who found that postgraduate users have many kinds of problems performing searches using library catalogues. Typical users do not have the range of knowledge and skills needed for effective searching.

5.3.3 Boolean operators

Boolean operators are used to enhance an individual's search options when conducting research. The use of boolean operators "and" "or" and "not" enable the researcher to narrow or broaden their search results. Question 11 investigated whether respondents were able to select the boolean operator "OR" that will broaden the research results. A significant percentage of respondents (67%), did not know which was the most appropriate boolean operator to use when broadening their search. The results clearly show that respondents were either unfamiliar with the use of boolean operators or were not adequately prepared to use them to enhance their search strategies. Hazrati, Gavgani and Ghornanian (2013: 6) support this notion by stating that students are unable to search by employing boolean operators. According to a study done by Ivanitskaya *et al.* (2012) students were unable to narrow a search by using multiple search categories simultaneously or by employing boolean operators.

5.3.4 Database search

Database searching has become more user friendly. Databases have found methods to harvest relevant and current search results by prompting users when searching for information. One of the methods is to search for a word typed by a user and find synonyms when results are retrieved by the database. This will help the user to not only search for information on the initial word typed but various other terms relating to the initial search. In question 12 respondents had to identify what synonyms one would be likely to retrieve from the search results if the word "engine" was entered as a search term. Just over half (53%) of the participants were unable to identify the most appropriate search results that would be retrieved. Amongst answers selected were "Articles that only focus on engineering", "Articles only on engine control modules" and "Articles only relating to engine". This further supports the point that students are unacquainted or do not have the necessary information literacy skills to retrieve the most suitable results for their research needs. Patterson (2009) in her study of needs analysis for information literacy provision for researchers indicates that postgraduate students lack confidence in the use of library sources. In particular, almost a quarter of the postgraduate students lacked confidence or familiarity when searching databases. This is also be supported by Harrington (2009) who

asserts that while graduate students are heavy users of the electronic collections they are not confident in their effective use of these sources.

5.3.5 Research articles

The aim of question 13 was to understand whether respondents would be able to identify academically credible research articles for their studies. The vast majority of respondents (93%) stated that they would use scholarly journals to find research published articles by scholars, experts or professionals. The results thus show that respondents are able to select the most appropriate source to find the information needed. This is affirmed by Mohammadi *et al.* (2015) who state that postgraduate students and postdoctoral researchers are the two most common readers of research articles.

5.4. Level of experience in evaluating information and its sources critically

The aim of this section was to determine whether postgraduate students had the necessary information literacy skills and knowledge to evaluate information sources critically when conducting research. The theme of evaluating information and its sources critically can be broadly classified under the category of evaluating information which relates to the ACRL third standard. The third standard states 'the information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system'. Questions 14, 15 and 16 explored the criteria that respondents would use to ensure the information gathered for research would be credible and valuable.

5.4.1 Authority (expert) in a specified field e.g. engineering thermodynamics

Authors publish material on various subjects that individuals then access and use for their research. The credibility of these authors is vital in terms of enhancing a piece of work that is used for academic purposes. Question 14 explored the criteria that should be applied when deciding to use a piece of work published by an author. In responding to this question, respondents were allowed to select more than one answer. Respondents were asked to decide how they would determine if an author is an authority on thermodynamics. A significant majority of respondents (78%) were able to evaluate if an individual is an authority on engineering thermodynamics. Amongst answers selected were "The individual

has published extensively in the field" and "Numerous articles on thermodynamics cite the individuals work". This reveals that respondents were able to distinguish an authority within their field of engineering when conducting research. In a study conducted by Julien and Boon (2013) students interviewed also spoke about an increased understanding on how to evaluate information used for research.

5.4.2 Evaluating a website

The Internet has become the primary source when searching for information. This is also prevalent with postgraduate students when searching for information for research purposes. Question 15 therefore endeavoured to determine whether respondents used certain criteria that would ensure academic value and credibility was not compromised when selecting information from websites for their research. In this study a majority (70%) of respondents were able to demonstrate an understanding of evaluating a website for research purposes. This they did by providing the correct responses to a question regarding the primary purpose of the Engineering Council of South Africa website. This suggests that postgraduate students are aware that information accessed on the Web must be evaluated. Saunders (2012: 230) reiterates this point by stating that most students understand that they must evaluate information they access on the Web.

5.4.3 Evaluating information sources

It is important that students are able to evaluate information sources when conducting research. They need to ensure that sources used for their study have academic value as these information sources provide their research with integrity and credibility. The researcher wanted to ascertain whether the postgraduate students in engineering at the DUT were able to understand what criteria to apply when evaluating information sources. A majority of 63% of respondents indicated that the criteria of currency of the information, credentials of the author, relevancy of the information source and accuracy of the information are all important components when critically evaluating information sources. This illustrates that postgraduate students in engineering at the DUT are able to critically apply themselves when evaluating information sources. A similar kind of trend is noticeable by Catalano (2010) in her study of using ACRL standards to assess the information literacy of graduate students in an education programme. Her study indicated that the majority of respondents were comfortable or very comfortable with evaluating information. Although the majority

of respondents were able to evaluate information sources when responding to question 16, what is of concern though is that 11 students (37%) were unable to give a correct response to the question. This finding does suggest that there is a sizeable minority of postgraduate engineering students whose information literacy skills are lacking in terms of the criteria used in the evaluation of information at the DUT. According to Bloom and Deyrup (2013: 204) in their study what was most disturbing is that students generally were unable to articulate criteria they would use to determine the credibility of sources. In a similar study done by Hazrati, Gavgani and Ghornanian (2013) the results clearly show that students' ability in reviewing the content and using the obtained information when involved in research, problem-solving and decision making is faced with major problems. They also do not have the knowledge and critical thinking skills to effectively locate, filter, and evaluate information found online.

5.5 Level of experience in incorporating selected information into one's knowledge base

The purpose of this section was to determine whether postgraduate students were able to incorporate selected information for research into their knowledge base by identifying the category of information to select for their study. The questions chosen were to determine the understanding of the respondents' use of journals for academic research. The outcomes of questions 18, 19 and 20 are discussed collectively as they deal with being able to assess and correctly extract the necessary information from an article in an academic journal to reference a piece of work for research purposes.

5.5.1 Academic value of a research work

In terms of understanding the academic value of research, postgraduate students must be able to acknowledge, distinguish or validate a credible researched source used and then select the necessary information needed to authenticate their research. The researcher wanted to assess if respondents were able to differentiate an academic peer reviewed publication from a piece of work that did not have the value of a peer reviewed resource. A majority of respondents (77%) had a clear understanding of peer review as being publications that have been evaluated by several researchers/subject specialists with credentials in the field related to the publications prior to them being accepted for publishing. Thus, postgraduate students understand the value of academically researched

works. This is also supported by Mohammadi *et al.* (2015) who state that postgraduate and postdoctoral researchers tend to use research articles more since they understand the additional value it brings it gaining comprehensive knowledge for research purposes.

5.5.2 Journal title, article title and volume number

It is an important component of research to be able to select the correct information when consolidating a reference from a source used, for example, an article in a journal. Respondents were therefore provided an example of a referenced journal article. They had to then identify which was the title of the journal, title of the article and the volume number. A significant majority (87%) of respondents correctly indicated that "Wind Energy" was the title of the journal. A similar majority (84%) of respondents correctly indicated that "Wind turbine condition monitoring: a scholarly perspective" was the title of the article. Further, a noteworthy (70%) of respondents were able to correctly indicate the volume number of the journal.

5.6 Level of experience in using information effectively to accomplish a specific purpose

A researcher needs to be competent in using information efficiently when conducting a study. This will ensure that the outcomes of the research are achieved. It can then be understood that to use information effectively an individual needs to understand various levels of identifying, searching, selecting and using information. The researcher needed to therefore investigate if postgraduate engineering students were able to effectively use information when conducting research to achieve specified outcomes. Referencing was used as an example to examine and assess the information literacy skills of respondents in understanding the purpose of using information.

5.6.1 Referencing

Referencing is a fundamental component in academic research. It supports the arguments, deliberations and discussion of researchers when engaging in a study. Referencing is therefore a method of acknowledging the sources of ideas, thoughts, opinions and information that have been used to compile assignments, projects, theses and dissertations. In assessing the respondents, question 21 explored respondents understanding of the Harvard style of referencing. The vast majority of respondents (87%) indicated that the

Harvard style referencing is a format to document sources used for a research paper which was the correct response to the question. This can be supported by Pinto *et al.* (2013) in her study where students were also able to identify different bibliographic styles when referencing in their research.

5.6.2 Reference list

The reference list appears at the end of an individual's research. A reference list can be explained as an alphabetical listing by the authors surname appearing at the end of a research, assignment or project. Such a list includes all the works cited within the text of the research, assignment or project. Each source cited in the study must appear in the reference list; likewise, each entry in the reference list must be cited in the text. The objective of question 22 was to determine if postgraduate students understood the importance of a reference list by understanding the significance of it in relation to research. A small majority of 53% of respondents showed that they understood what a reference list was by selecting the correct answer. Disconcerting is the substantial minority (47%) of postgraduate engineering students who showed no clear understanding and this is a matter of concern.

5.6.3 Citations

Citations and reference lists are interrelated. Citations allow the reader of a piece work to locate and read the sources accessed by the researcher/s. They also allow the reader to determine the credibility of the sources used for the research, give credit to the author and assist in avoiding plagiarism. Citations therefore have an important role in research. The correct use of citations gives academic credence to a piece of work. In question 23 the researcher wanted to establish whether postgraduate engineering students at DUT were able to understand the value and importance which citations have in relation to research. Although all the options provided were correct for this question, the correct response was for respondents to select all the choices stipulated in the question. It is important to note that only 30% of respondents selected all the choices for this question. The postgraduate students therefore did not show a clear understanding of the use of citations. This points to the fact that although most postgraduate students understand what referencing is and the need for a reference list they are not totally clear about the use of citations in research. This issue however is not limited only to DUT. In a study by Dubicki (2013) academics

indicated students need to understand when to use citations. Further in Kingsley *et al.* (2011) it is reiterated that students were unable to provide academically credible citations to demonstrate their proficiency in using citations when referencing information for research. Students used citations and references from sources such as advertisements and promotional materials including personal websites. According to Ivanitskaya *et al.* (2012) postgraduate students displayed poor skills when attempting to evaluate websites and were unsure if they needed to provide references for ideas expressed in paraphrased sentences or sentences whose structure they modified.

5.7 Level of experience in understanding the legal and ethical use of information

The theme of understanding the legal and ethical use of information can be generally be categorised under the ACRL fifth standard. The fifth standard states "the information literate student understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally." The purpose of this section was to determine whether postgraduate engineering students at DUT were able to demonstrate an understanding of intellectual property, copyright and the fair use of copyrighted material when conducting postgraduate research. In the researcher's attempt to ascertain the student's legal and ethical use of information various questions were asked pertaining to this issue as described by the ACRL.

5.7.1 Inappropriate use of information

The inappropriate use of information has become common practice within higher education and takes different forms. This includes students copying during exams and tests and plagiarising when conducting research. It has increased with the use of the Internet. It was therefore important to understand if postgraduate students were aware of what was understood as the inappropriate use of information. The results show that the vast majority (93%) of respondents understood what constituted the inappropriate use of information by specifying that copying text from a website without identifying the source is plagiarism. However, research has shown that although students understand plagiarism they still copy information for their research, assignments and projects. This can be supported by Ramzan *et al.* (2012) who state in their study that most of the students did not perceive that plagiarism was a serious threat to academic integrity and were prepared to receive a

warning for the first time violation of the plagiarism policy. The researcher has observed that at the DUT a similar pattern is prevalent with students, at all academic levels who commit plagiarism when conducting research. This is an issue that needs to be addressed by universities globally.

5.7.2 Protection by law for an individual's work

It is an individual's legal right to be protected by copyright for an item that has been produced by him or her. Within the higher education spectrum and especially in the Faculty of Engineering, students produce many inventions that can become a financially viable option for an individual. It was therefore important to establish whether postgraduate engineering students were mindful of the protection by law for an individual's work. Again the vast majority (97%) of respondents indicated that the concept of copyright makes it is legally wrong to reproduce a substantial portion of the work of another person without permission. The shows that respondents were able to understand the role that copyright plays when conducting research and the legal implications for an individual when using information from a source without acknowledgment.

5.7.3 Protection by law for a work produced

An individual may have an understanding of protection by law of an individual's work. However it is fundamental that postgraduate students also recognise that intellectual property produced in various formats are also protected by law. The researcher explored this question by providing various options of produced works in different formats. The most appropriate response to this question would have been to select all formats listed as being covered by copyright law. A majority (67%) of respondents did specify that all the formats listed are protected by copyright law. This meant that a third (33%) of respondents did not understand that all formats are subject to copyright and the legal implications that could arise from this lack of understanding. In a study done by Ullah and Ameen (2014) few librarians reported addressing plagiarism, copyright and citation management in information literacy instruction. It is evident that more attention needs to be paid to these areas, as the ACRL standards state that the information literate student "understands many of the economic, legal, and social issues surrounding the use of information and accesses and uses information ethically and legally."

5.8. Results of interviews with postgraduate librarians at the DUT

Interviews were conducted with the two postgraduate librarians at the DUT. The interviews were administered separately to ensure that interviewees were not influenced by each other's responses.

5.8.1 Discussion relating to personal information

This section discusses the following variables: designation, education level and experience of the respondents.

5.8.1.1 Designation

The first question of the interview schedule identified the job descriptions of the interviewees. Both respondents are postgraduate librarians at the DUT. However both the respondents had specific faculties that they supported in terms of their job descriptions. Although respondent A is currently supporting the Faculty of Engineering it is important to note that respondent B was responsible for the Faculty of Engineering prior to her assuming responsibility for the Faculties of Art and Design and Management Sciences.

5.8.1.2 Education level

The librarians were asked about their qualifications in relation to their job description. The postgraduate librarians both held a Master's qualification in Information Science. This is crucial since they are supporting the research needs of postgraduate students. The postgraduate librarians therefore would have an understanding of the research process and the expectations of the students since they would have had experience in research themselves. Besides relating to students in terms of their research it is also a prerequisite for the portfolio as a postgraduate librarian at DUT to have a postgraduate qualification. Although the postgraduate librarians had the qualification and experience they did not have any formal teaching qualification either from library and information science or from education. This can been seen as an area which, if improved upon, can enhance delivery of information literacy workshops, lectures and training to postgraduate students by the librarians. Lack of pedagogical skills are not restricted to DUT. According to Brown and Mokgele (2007) librarians are not trained as teachers or trainers, and although many are happy to do one-on-one training of clients, standing before an audience is a problem for them. A similar view is shared by Cox and Corrall (2013) who explain that only a few

professional librarians have received formal teacher education or training prior to taking on instructional responsibilities. The authors point out that the vast majority of practitioners gain and maintain their pedagogical know-how on the job, through a mix of trial and error, in-service training and education, professional reading, mentoring and networks.

5.8.1.3 Length of time in current position

Question 3 determined the length of time that the respondents held their current positions. The results show that both respondents had been in their current positions from three to six years. Both the participants interviewed were therefore expected to have a good understanding of the postgraduate student's information literacy skills given their experience as librarians at the DUT.

5.8.1.4 Information literacy experience

The purpose of question 4 was to ascertain the information literacy experience of the postgraduate librarians prior to them being employed at DUT. It was evident that the postgraduate librarians possessed a wealth of experience in information literacy. They both had a combined experience of more than twenty five years relating to information literacy at higher education institutions outside of their current positions at DUT. This included supporting the research needs of undergraduate and postgraduate students, academics and administrative staff. Generally librarians, as noted above, lack pedagogical skills because of their non-exposure to teaching modules at library and information science schools and therefore experience has primarily been the marker for developing teaching practice skills relating to information literacy in higher education institutions (Houtman 2010). This was evident when questioning the postgraduate librarians in that experience had been the best teacher for them to develop their teaching skills in relation to information literacy. In addition, although the focus of this study was not the information literacy competencies of academic librarians, in a study done by Ojedokun (2014) relating to academic librarian's information literacy skills the results were startling. The author noted weaknesses in librarian's knowledge of each of the steps in the information research process, from identifying the concepts to using the results. This included areas such as being unable to recognise the characteristics of a scholarly journal and to distinguish between library catalogues and bibliographic databases; little knowledge of the benefit of bibliography; when to include bibliographic references or quote a source and of the criteria for evaluating

information from the web; and having a limited understanding of web search tools. Thus, the problem of addressing issues such as a lack of pedagogical skills and, arguably more importantly, a lack of understanding of information literacy by academic librarians at DUT (assuming that such a lack may exist) is an important one. This can be achieved through various professional development initiatives such as training, workshops and professional teaching qualifications.

5.8.2 Information literacy and higher education

The aim of this section was for the respondents to deliberate and reflect upon information literacy and the current South African tertiary education environment. The postgraduate librarians were prompted into providing insights into information literacy and the South African education system.

5.8.2.1 Information literacy and higher education in South Africa

With question 5 the researcher sought to engage the respondents regarding their understanding of information literacy within South African higher education institutions. The views or perceptions of both candidates were different but they shared a few commonalities. The respondents contextualised the understanding of information literacy in the current South African higher education situation by focusing their discussions around preparing students for the workplace by creating lifelong learners. In the creation of a lifelong learner there was importance placed on students having the ability to be efficient in the finding and using of information. This component of information literacy provides the opportunity for a student to remain current and updated within their respective industries including focusing on improving their professional development. The respondents also provided feedback based on their experiences as professional librarians within the context of higher education. Although a question pertaining to the information literacy skills of students was to follow later in the interview, one of the respondents mentioned at this stage that from her experiences students lack information literacy skills.

5.8.2.2 Information literacy and secondary schools

Question 6 sought to explore whether the postgraduate librarians believed that the gap in information literacy skills is because of a lack of emphasis placed on this at secondary school. The interviewees, in answering this question, provided different perspectives.

Respondent A felt that she was not a participant within the secondary school system and therefore was less forthcoming in providing feedback to this question. However, respondent A did make an important comment regarding the fast paced technological environment that students are exposed to at all levels of their educational experience and that information can be accessed through the Internet. Although this may not be directly related to the question asked it is important to take cognisance that information is accessible from virtually anywhere and not restricted to a confined space, for example, a building. This means that even at secondary schools students can have access to information and be made aware of how to use information through information literacy initiatives. In contrast respondent B was of the opinion that the gap in information literacy at various levels of higher education has its origins in a lack of interest shown at schools. A very important conclusion drawn by respondent B was that there are underlying reasons as to the lack of information literacy at school level. These reasons include lack of facilities such as libraries, lack of resources such as books and computers and technological barriers such as no access to the Internet. Within the context of the feedback by respondent B these reasons are not only applicable to South African schools. According to Jiyane and Onyancha (2010) considering the main obstacles for information literacy in Africa, notwithstanding South Africa, are:

- children have very little pre-literacy training at home, or exposure to books, as their parents are often illiterate;
- there are not enough books written in the languages of Africa that are suitable for neo-literates, particularly adult neo-literates, and thus learning to read involves, at the same time, English or some other European languages;
- many teachers are not qualified, but are simply those who have successfully passed through the school system;
- and there is little opportunity to practice the newly gained skills, through lack of libraries and general high cost of books, even if they are available.

5.8.3 Information literacy and the DUT

The population at the DUT consists of a large group of previously disadvantaged students. The students due to their backgrounds have unstable socio-economic situations. The exposure of these students to education within their community has its limitations as mentioned in the earlier discussion. This could be a key factor as to why many of the

students who register at the institution do so with limited information literacy skills and this can continue through to postgraduate studies. This section sought to examine if a common opinion was shared by the postgraduate librarians regarding the information literacy skills of both undergraduate and postgraduate students at the DUT and specifically within the Faculty of Engineering.

5.8.3.1 Information literacy skills of undergraduate students at the DUT

Question 7 was asked to determine if undergraduate students at DUT lacked information literacy skills. The postgraduate librarians were explicit in their response. They remarked that the undergraduate students at the DUT lacked information literacy skills and this was not limited to the Faculty of Engineering only. This was a common problem being experienced by librarians and academics in all six faculties. It was also mentioned by the respondents that students need to develop their information literacy skills and, if they do have skills then they need to further develop them in preparation for industry. A similar conclusion is drawn by Hill, Macheak and Siegel (2013) in their results of the assessment of students' information literacy skills at the University of Arkansas. The results indicated that students lacked key research skills needed for academic success. Students experienced difficulties in taking a research problem and developing a research strategy, identifying appropriate information resources, searching these resources, and then retrieving, critically evaluating, and documenting the published sources needed to address their research problem.

5.8.3.2 Information literacy skills of postgraduate students at the DUT

The purpose of question 8 was to investigate whether a pattern or trend of students lacking in information literacy skills continued into postgraduate studies. The postgraduate librarians shared the same views supporting the notion that students making the transition from undergraduate to postgraduate studies are lacking in information literacy skills at the DUT. Conway (2011) and Hodgens, Sendall and Evans (2012) support the comments made by the postgraduate librarians that students lack information literacy skills when entering postgraduate studies. According to them students would benefit in acquiring information literacy skills early on in their course. If students are given the opportunity to self-assess within undergraduate levels when conducting assignments and projects and continue to apply information literacy skills, they will be better equipped to conduct research at

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postgraduate levels and ultimately becoming highly skilled researchers. Thus, it is important that academics and librarians collaborate at undergraduate levels to create structured information literacy programmes that will indefinitely benefit students at postgraduate levels. This will produce postgraduate students capable of conducting and producing valuable research at the DUT ultimately increasing the research throughput rate at the institution. However, the postgraduate librarians did mention the diverse student groups they interact with at the postgraduate level. They pointed to pockets of students who have had some information literacy skills training at undergraduate levels of their studies. These are students who directly pursued a postgraduate qualification after their undergraduate studies. Although they lacked advanced information literacy skills they did have the basic information literacy skills making it easier for the respondents to work with them. Another group of students which postgraduate librarians at DUT were exposed to were the work force group. These were students returning after many years of working in industry to pursue a postgraduate qualification. The respondents mentioned that these individuals had many problems in grasping and understanding information literacy. They had to be given additional support to ensure that they understood how to identify, find, evaluate and use information responsibly for their research. The trend with these students was to ensure that they also attend the same workshops on issues such as topic analysis, accessing and using of information, and referencing, but to do so, whenever possible, more than once. Repetition it was felt, would lead to better understanding in areas of information literacy, and by doing so, build postgraduate students own research capacity.

5.8.3.3 Postgraduate students at the DUT and the lack of information literacy in specific areas
With question 9 the researcher wanted to determine in which specific areas of information literacy postgraduate students lacked the necessary skills to conduct research. Although the research aimed to understand the information literacy skills of the postgraduate engineering students, the respondents were confident to mention that a lack information literacy skills was prevalent amongst all postgraduate students at the DUT. The respondents perceived that postgraduate students lacked information literacy skills in the following areas:

- searching for information;
- analysing a topic;

- identifying, searching and using suitable keywords;
- developing a search strategy;
- evaluation of information, and
- referencing information sources.

It is evident that the areas mentioned run the gamut of needed information literacy skills and the findings from the questionnaire given to students and discussed above, support the areas indicated by the postgraduate librarians. In terms of searching for information, analysing a topic, identifying and using suitable keywords and developing a search strategy, the findings from the questionnaire reflect a similar lack of information literacy skills by postgraduate students.

5.8.3.4 Objectives of information literacy at the DUT

This aim of question 10 was to explore if the postgraduate librarians believed that the objectives of information literacy were being met at the DUT. Although respondents indicated that while there is work to be done for the information literacy objectives to be reached they also stated that there has been an improvement in the information literacy initiatives for postgraduate students over the past three years. According to Respondent A the improvement is supported by a recent postgraduate survey which indicated that research support and training has had value for postgraduate students. This survey was conducted towards the end of 2014 by the postgraduate librarians and provided data with which to profile postgraduate use of the library resources, facilities and services. Respondent B, however, asserted that until information literacy becomes compulsory not every student will attend. She further stated that this is a problem and a trend at both undergraduate and postgraduate levels. Compulsory information literacy training would alleviate the lack of information literacy skills by postgraduate students according to respondent B. The respondent went on to say that academic integration and embedding information literacy into the curriculum would also improve student information literacy skills. The views and perceptions of respondent B are shared by Dubicki (2013) in her research of 'faculty perceptions of students' information literacy skills competencies. She asserts that one of the themes repeated throughout her research is that information literacy needs to be incorporated into the entire curriculum in order to successfully build students information literacy skills, and to fulfil goals for student learning. Information literacy skills should be a

shared responsibility of all faculty, not just those teaching composition and research courses. Dubicki (2013) also states that in the opinion of many faculty members, practice is the key to learning and developing information literacy skills. If these skills are used sporadically, students will not fully achieve high competency levels. On the other hand, if students start learning information literacy skills during their first year of study and the skills are reinforced regularly from year to year in subsequent classes, students will improve with practice. Thus, academic integration for information literacy to be successful is a three way process. The academic, student and librarian are equally responsible for improving information literacy skills throughout the tertiary experience of the student. Miller and Murillo (2012) confirm this by stating students relationships with librarians are certainly affected by library-faculty relationships: 'for librarians, building relationships with professors is critical for building relationships with students. Students go to professors for help. Librarians can build relationships with faculty to ensure that faculty recommend that students seek librarians for help'. Therefore a barrier to information literacy is when there is a lack of interest is shown by the academics within a faculty resulting in poor information literacy skills of students as they progress from undergraduate programmes into postgraduate research. The above is supported by Baro and Keboh (2012) whose research clearly indicates that students show a lack of interest in information literacy due to the fact that the information literacy programmes are not part of the curriculum, and academic staff do not give assignments that encourage rigorous use of both print and electronic resources available in the library.

5.8.3.5 DUT information literacy instruction design and postgraduate students
The objective of question 12 was to determine whether the DUT information literacy instruction design catered for the research support as required by postgraduate students. According to the respondents, prior to 2015 the postgraduate librarians adopted a flexible approach in terms of how they developed lessons and taught information literacy to students. However, as of 2015 a more structured approach to information literacy is being considered with a view to implementation using the ACRL model as a guide for the development of an information literacy design for postgraduate students which includes specific outcomes and objectives. This information literacy design is a work in progress as the postgraduate librarians have created an outline of an instructional design but they have

not actioned it as yet. It was indicated by Respondent B that in creating the information literacy instructional design it would be beneficial to benchmark it against current best practices within the postgraduate ambit in Southern Africa and globally. This can act as a support mechanism in bridging the gap between postgraduate students and their information literacy skills making it easier for students at postgraduate levels at the DUT to effectively conduct research.

5.9 Summary

In this chapter the findings presented in Chapter four were discussed. The research questions of the study were used as a basis for the discussion. What emerged was that postgraduate engineering students' information literacy skills varied. In certain areas postgraduate engineering students' were poor in their use of information literacy skills whilst in other areas they demonstrated good information literacy skills. The next chapter presents the conclusions and the recommendations which emerged from this study.

Chapter six: Summary of findings, conclusion and recommendations

6.1 Introduction

The main purpose of this study was to identify what the information literacy skills of postgraduate engineering students at the DUT are. The study attempted to answer the following three questions:

1. What information literacy skills do postgraduate engineering students bring from their undergraduate studies at the DUT?
2. What are the major challenges postgraduate engineering students experience in learning and applying information literacy skills?
3. How can information literacy skills be enhanced amongst postgraduate engineering students?

Data to answer the research questions and to serve the intended purpose of the study were collected from 30 respondents (all postgraduate engineering students), using self-administered questionnaires, and from two postgraduate librarians, using face-to-face interviews.

6.2 Study overview

The introductory Chapter one began with a brief background to information literacy and its influence and importance within education, particularly higher education. It also included the researcher's motivation for the study, the methodology and research problem, key questions to be asked, limitations and delimitations, and finally the definitions of keywords.

Chapter two presented the literature review. This included an overview of the various models of information literacy. The first part of the literature review covered the different models of information literacy that can be implemented by various higher education institutions globally. The second part presented the role of the ACRL model within the higher education ambit. It also covered the issues within information literacy instruction at higher education institutions with emphasis on the situation at DUT.

The research methodology was described in Chapter three. Two methods were used to gather information on the information literacy skills of postgraduate engineering students at the DUT. These were the semi-structured interviews and the self-administered questionnaire. In addition to these two methods, the review of related literature contributed to the gathering of information.

The findings of the study were presented in Chapter four and interpreted and discussed in Chapter five.

This chapter presents the summary of the findings, conclusions and recommendations of the study.

6.3 Summary of the findings

This section summarises the findings of the study as per the research questions.

Research question one: What information literacy skills do postgraduate engineering students bring from their undergraduate studies at the DUT?

As noted in the literature review, higher education libraries have pockets of successful implementation of information literacy at undergraduate level. This trend is also apparent at the DUT as observed by the researcher and affirmed through the interviews with the postgraduate librarians. However, this study focused on the information literacy skills of postgraduate engineering students at the DUT and what information literacy skills they brought from their undergraduate studies into graduate research programmes. This study also explored if postgraduate students lacked key information literacy skills when conducting research. Although postgraduate engineering students were lacking in various areas of information literacy, when they were assessed through the self-administered questionnaire there were certain aspects where their information literacy skills could be considered acceptable. This indicated that the postgraduate engineering students did bring a certain degree of information literacy skills through from the undergraduate level. These included the following:

- students were able to identify credible research articles for their studies
- they were able to evaluate websites, authors and information sources critically when selecting information for their research
- the students understood the concept of copyright but could not identify with all the formats such as CD's, DVD's and videos as being protected by copyright law

The areas in which the postgraduate students were lacking in terms of information literacy skills are outlined under Research question two below.

Research question two: What are the major challenges postgraduate engineering students experience in learning and applying information literacy skills?

The findings of this study revealed that while at DUT there is information literacy support and training for undergraduate and postgraduate students within the Faculty of Engineering it is not embedded within teaching, learning and research because it is not regarded as important to the holistic development of the student compared to other aspects such as the curriculum. There is therefore a tendency for academics and students' to overlook information literacy at undergraduate levels within the Faculty of Engineering at the DUT and presumably at other higher education institutions as well, as observed by the researcher from the findings of this study. Of the 30 postgraduate engineering students who took part in the study, a combined 67% of students did not attend any form of information literacy at undergraduate levels either at the DUT or at any other higher education institution as gathered from the results in question 3 and 4 from the self-administered questionnaire.

Students at the DUT are therefore filtering into postgraduate engineering programmes with minimal exposure to information literacy and therefore lack the relevant information literacy skills required to effectively conduct research. It is evident from the interviews held with the postgraduate librarians that there is insufficient engagement, collaboration and partnering between academics and subject librarians at the DUT at undergraduate levels to integrate information literacy within the curriculum.

Thus, the findings of this study through the interviews conducted with postgraduate librarians, the observations from the researcher throughout this study and most importantly, the self-administered questionnaire that assessed postgraduate engineering students' information literacy skills, confirm that postgraduate engineering students involved in research at the DUT are lacking in key areas of information literacy that are essential when conducting research. This can be from the discussion of the findings in Chapter five of this study. The postgraduate engineering students lacked in various information literacy skills and these included the following:

- they were unable to identify the keywords in their research topic which demonstrates the lack of an important information literacy skill, which is being able to identify relevant keywords that will guide them in finding credible information for their research;
- were unable to form a search strategy by analysing their topic to find relevant information for their research and did not understand the importance of the use of reference sources such as dictionaries including encyclopaedias that would have supported them in gaining a clear understanding of their topic;
- unable to apply their understanding to construct a search using the DUT library catalogue;
- did not know how to manipulate boolean operators when broadening their search. The results clearly show that respondents were either unfamiliar with the use of boolean operators or were not adequately prepared to use them to enhance their search strategies;
- were unacquainted or did not have the necessary information literacy skills to retrieve the most suitable results for their research needs when searching academic databases. This was because students lacked confidence, familiarity and the necessary information literacy skills when searching academic databases for information when conducting research;
- did not have any understanding of what a reference list was and were uncertain on how to use citations when conducting research.

It is also important to highlight that the findings of the researcher through the assessment of the postgraduate engineering students' information literacy skills complement the findings from the interviews conducted with the postgraduate librarians. In the interviews the postgraduate librarians underscored similar conclusions in terms of the postgraduate students lack of information skills, namely, searching for information, analysing a topic, identifying and using suitable keywords, developing a search strategy and referencing.

Research question three: How can information literacy skills be enhanced amongst postgraduate engineering students?

As discussed in Chapter five, there are many ways that information literacy can be improved as outlined by the postgraduate librarians. The key factors included academic integration, credit bearing information literacy instruction, embedding information literacy within the curriculum and partnering of academics and librarians at both undergraduate and postgraduate levels.

Ullah and Ameen (2014) supports the findings of this study, as according to them, integrating information literacy instruction into the curriculum cannot be done by the library alone. Librarians will need support from students, academic staff, and administrators, which requires a sustained effort, negotiation, and communication.

6.4 Conclusions

From the literature reviewed and the findings of the study, it was revealed that similar problems identified in this study persist globally in terms of information literacy skills of postgraduate students in higher education institutions. What emerged was that postgraduate student's information literacy skills were, in general, lacking. This was, to a large extent, in accordance with the literature, that suggested that South African students enter higher education institutions lacking in information literacy skills and this pattern continues into postgraduate programmes as is the case of the DUT. The literature and findings also pointed to the fact that the lack of information literacy skills at postgraduate levels is common globally and not limited to the DUT and the South African context only.

This study looked at information literacy skills of postgraduate engineering students in detail and it is evident that there are key areas where there are gaps in their skills. These

gaps need to be addressed. The literature reviewed indicates that information literacy within the higher education ambit can be improved if the following aspects are acknowledged and rectified:

- Academic integration, engaging and partnering between university administrators, academics and librarians to enhance information literacy within higher education (Lawal *et al.* 2010);
- Embedding information literacy instruction within the curriculum and ensuring that it is credit bearing (Ullah and Ameen 2014);
- Academics recognizing the importance of information literacy for the development of students from their undergraduate studies into the postgraduate programmes. Hence the need for collaboration with librarians to implement and sustain information literacy instruction within the curriculum;
- Academic librarians needing to improve and develop their pedagogical skills and their understanding of information literacy to become competent in the delivery of information literacy instruction (Ojedokun 2014);
- Active and regular involvement of academics in the creation of innovative information literacy modules within their curriculums;
- Benchmarking within the South African higher education context and, if possible, globally with other similar institutions to understand which best practices can be adopted and used that are appropriate for the DUT community.

Generally speaking, information literacy can be one of the driving forces in improving the research throughput rate in higher education. This is supported by Vahed (2014: 17) who states that although the throughput is not a measurement of the quality in higher education, poor throughput rates question the value of a programme and qualification in higher education institutions. Thus, information literacy can be one of the drivers of change in improving the throughput rate at the DUT. If students have the necessary information literacy skills to conduct research and work independently to fulfil the outcomes of their study responsibly, issues such as plagiarism and copyright can be nullified (Sentleng and King 2012). Thus, the full implementation of information literacy within the academic ambit and into the curriculum for all courses at DUT needs to be realised if the DUT library is to fulfil its vision of "being a student-centered library that enhances learning, teaching

and research through the provision of information services, access policies and instruction programmes in line with the objectives of the university". The results of the present study show that the issue of poor research skills and the lack of knowledge to identify, access and use information responsibly because of the lack of information literacy skills amongst postgraduate students were among the main concerns of the postgraduate librarians when asked about the information literacy skills of postgraduate students at the DUT. The lack of these skills is also clearly visible from the assessment of the postgraduate engineering students through the self-administered questionnaire.

It can be established from the results of this study that it is apparent that the lack of information literacy skills of postgraduate engineering needs to be addressed. Although DUT library information literacy instruction is based on the ACRL information literacy model which is founded and established on standards and outcomes in improving the information literacy of students at higher education institutions globally, DUT needs to ascertain how to implement the model in an innovative and diverse way to suit the students at the institution. It is evident that the current information literacy design and instruction needs to be revised to meet the growing and changing information literacy needs of students at DUT. An example of this from the researcher's experience would be that the DUT library's presence in teaching information literacy within the online environment is limited as although the ACRL model does address the issue of online teaching, DUT has not embraced this sufficiently.

For this reason it is crucial for the DUT library to be able to not only embrace the latest technological trends in academic libraries but to make informed decisions as to what would work for the users at DUT as an institution when using technology and applying it in information literacy instruction design. Factors such as bandwidth, costs, user friendliness, and lack of skills by academic librarians are only some of the challenges that need to be understood, rectified and developed when embracing technology in teaching, promoting and enhancing information literacy within the institution. Most importantly when improving information literacy at all levels, the ACRL standards and outcomes must be used as a guide to improve and revise the information literacy instruction by the DUT library.

It is important to note that DUT is an international institution and professional library staff from the institution must, therefore, take cognisance of implementing the ACRL model for information literacy effectively and efficiently since the focus of the library is to enhance teaching, learning and research within the DUT community. It can be concluded that although postgraduate students may not lack information literacy skills in every aspect of research there are key areas were emphasis needs to be placed to either develop their skills from undergraduate level or enhance these skills from a postgraduate research perspective.

6.5 Recommendations

As advised by various authors from the literature reviewed (Catalano 2010; Jiyane and Onyancha 2010; Conway 2011; Hodgens, Sendall and Evans 2012; Ojedokun 2014) the lack of information literacy skills of students are apparent from undergraduate level into postgraduate studies. This trend is also evident with the postgraduate engineering students at the DUT. Thus based on the literature, the findings and the conclusions made above, the following recommendations are made to assist in improving information literacy skills of postgraduate engineering students at the DUT:

- Key stakeholders such as university administrators and management need to acknowledge the importance of information literacy and develop strategic objectives for teaching, learning and research including information literacy as one the drivers of change within the goals of the institution.
- Library management needs to assess, reflect and invest in supporting the development of the academic librarians through continuous professional development programmes, workshops and qualifications in education that will allow them the opportunity to gain the necessary pedagogical skills when teaching information literacy to students. What skills exist have been developed through experience in library information literacy instruction as stated by the postgraduate librarians.
- Partnerships and collaborative teaching strategies need to be integrated covering different areas of information literacy such as topic analysis, searching for information, referencing and plagiarism. This can be achieved through liaison with faculty representatives and academic staff to integrate information literacy into the mainstream curriculum. This will aid in improving information literacy skills of

students as identified in the findings of this study. Thus, it is important that academics and librarians within the Faculty of Engineering at the DUT collaborate and create partnerships to improve the information literacy skills of undergraduate engineering students at the university to ensure that at postgraduate levels students are effective in conducting research independently.

- The importance of information literacy needs to be recognised by ensuring that the information literacy instruction becomes credit bearing including formative and summative assessments. This will mandate students at all levels within the Faculty of Engineering to attend information literacy instruction thus improving their information literacy skills through a scaffold approach of learning from undergraduate to postgraduate levels. This will allow engineering students to consistently develop their information literacy skills throughout their educational development at the DUT and so become efficient researchers at the postgraduate level.

- DUT library should create awareness regarding the plagiarism policies of the institution through workshops, marketing campaigns, writing centres, academics and information literacy instruction to make students conscious of the legal implications of plagiarising. While the issue of plagiarism needs to be addressed by the DUT as an institution, the library can be an important role player in this regard.

- Development of a relevant and interactive information literacy website at the DUT. This can direct students to independently complete tutorials or view videos to build and reinforce information literacy skills covered in class. This website could be a useful tool to consolidate and enhance students' information literacy skills at all levels for their studies.

- Emphasis should be placed by subject and postgraduate librarians on the use of sources such as Libguides (subject guides) including citation generators such as RefWorks and Almetrics when teaching information literacy education to postgraduate students.

6.6. Suggestions for further research

The findings of the present study provide a perspective of the information literacy skills of postgraduate engineering students at the DUT. From these findings, fundamental

approaches could be developed to enhance information literacy skills of students within the DUT. Although there has been research done at DUT on the topic of information literacy nothing was done prior to this research on the information literacy skills of postgraduate students. This pattern of limited research on the information literacy skills of postgraduate students is a global perspective and not restricted to DUT (du Bruyn 2013). Considering the fact that little research of this kind has been done at DUT, there is therefore a need for more studies relating to information literacy skills of postgraduate students.

These could include:

- A study to determine the information seeking behaviour of postgraduate students at the DUT;
- Conducting similar studies at other South African university libraries in order to find out if the results, would replicate those of the present study;
- Replicating this study with other groups of postgraduate students at DUT to get a broader understanding of information literacy skills among students at the institution not limited to the Faculty of Engineering.

References

ACRL. 2000. *Information literacy competency standards for higher education* (online). Available: http://www.ala.org/acrl/standards/informationliteracycompetency (Accessed 18 March 2014).

ALA. 2000. *Information literacy competency standards for higher education* (online). Available: http://www.ala.org/acrl/standards/informationliteracycompetency (Accessed 18 March 2014).

ALA. 1989. *American Library Association presidential committee on information literacy: final report*. American Library Association.

Andretta, S. 2005. *Information literacy: a practitioner's guide*. Oxford: Chando's Publishers.

Asher, A. D., Duke, L. M. and Wilson, S. 2013. Paths of discovery: comparing the search effectiveness of EBSCO discovery service, summon, google scholar, and conventional library resources. *College and research libraries*: 74 (5) 464-488.

Attewell, P. 2001. Comment: the first and second digital divides. *Sociology of education*: 74 (3) 252-259.

Babbie, E. R. and Mouton, J. 2001. *The practice of social research*. Cape Town: Oxford University Press Southern Africa.

Baro, E. E. and Keboh, T. 2012. Teaching and fostering information literacy programmes: a survey of five university libraries in Africa. *The journal of academic librarianship*, 38 (5): 311-315.

Baruch, Y. and Holtom, B. C. 2008. Survey response rate levels and trends in organizational research. *Human relations*, 61 (8): 1139-1160.

Bent, M., Gannon-Leary, P. and Webb, J. 2007. Information literacy in a researcher's learning life: the seven ages of research. *New review of information networking*, 13 (2): 81-99.

Bertram, C. and Christiansen, I. 2014. *Understanding research: an introduction to reading research*. Pretoria: Van Schaik.

Blanche, M. J., Durrheim, K. and Painter, D. 2006. *Research in practice: applied methods for the social sciences*. Cape Town: Juta.

Bless, C., Higson-Smith, C. and Kagee, A. 2006. *Fundamentals of social research methods: an African perspective*. Cape Town: Juta

Bloom, B. S. and Deyrup, M. 2013. *The truth Is out: how students really search* (online). Available: http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1360&context=charleston (Accessed 5 August 2014).

Bloomberg, L. D. and Volpe, M. 2012. *Completing your qualitative dissertation: A road map from beginning to end*. California: Sage Publications.

Booth, A. and Tattersall, A. 2009. *Supporting the health researcher of the future* (online). Available:
http://www.academia.edu/2723452/Supporting_The_Health_Researcher_Of_The_Future (Accessed 10 June 2014).

Bracke, M. S. 2011. Emerging data curation roles for librarians: A case study of agricultural data. *Journal of agricultural and food information*, 12 (1): 65-74.

Brannen, J. 2005. Mixing methods: The entry of qualitative and quantitative approaches into the research process. *International journal of social research methodology*, 8 (3): 173-184.

Brewerton, A. 2012. Re-skilling for research: investigating the needs of researchers and how library staff can best support them. *New review of academic librarianship*, 18 (1): 96-110.

Brown, L. and Mokgele, M. 2007. Information literacy skills training of staff and students in the Unisa Library: challenges and opportunities. In: *Proceedings of the IFLA Conference*. South Africa, 19-23 August 2007. Durban: 1-12.

Bruce, B. C. 2003. *Literacy in the information age: inquiries into meaning making with new technologies*. Newark: International Reading Association.

Bryman, A. 2012. *Social research methods*. Oxford: Oxford University Press.

Bundy, A. 2001. *For a clever country: information literacy diffusion in the 21st century* (online). Available: http://ura.unisa.edu.au/R/?func=dbin-jump-full&object_id=unisa28841 (Accessed 5 May 2014).

Bundy, A. 2002. Growing The community of the informed: information literac a global issue. *Australian academic and research libraries*, 33 (3): 125-134.

Bundy, A. 2004. Australian and New Zealand information literacy framework. *Principles, standards and practice*, 2: 1-48.

Burbules, N. C. and Callister Jr, T. A. 2000. *Watch IT: the risks and promises of information technologies for education*. Illionois: Westview Press.

Carlson, J. 2012. Demystifying the data interview: developing a foundation for reference librarians to talk with researchers about their data. *Reference services review*, 40 (1): 7-23.

Catalano, A. J. 2010. Using ACRL standards to assess the information literacy of graduate students in an education program. *Evidence based library and information practice*, 5 (4): 21-38.

Childers, S. 2003. Computer literacy: Necessity or buzzword? *Faculty publications*, 90: 100-104.

Cohen, L., Manion, L. and Morrison, K. 2013. *Research methods in education*. London: Routledge.

Conway, K. 2011. How prepared are students for postgraduate study?: A comparison of the information literacy skills of commencing undergraduate and postgraduate information studies students at Curtin University. *Australian academic and research libraries*, 42 (2): 121-135.

Cox, A. M. and Corrall, S. 2013. Evolving academic library specialties. *Journal of the American society for information science and technology*, 64 (8): 1526-1542.

Creswell, J. W. 2014. *Research design: qualitative, quantitative, and mixed methods approaches*. California: Sage Publications.

Critz, L., Axford, M., Baer, W. M., Doty, C., Lowe, H. and Renfro, C. 2012. Development of the graduate library user education series. *Reference services review*, 40 (4): 530-542.

Cullen, R. 2001. Addressing the digital divide. *Online information review*, 25 (5): 311-320.

Czerniewicz, L. and Brown, C. 2009. A virtual wheel of fortune? Enablers and constraints of ICTs in higher education in South Africa. *Bridging the knowledge divide: educational technology for development*: 57-76.

De Jager, K. and Nassimbeni, M. 2002. Institutionalizing information literacy in tertiary education: lessons learned from South African programs. *Library trends*, 51 (2): 167-184.

De Jager, K. and Nassimbeni, M. 2003. An exploration of the current status of information literacy tuition in South African tertiary institutions and proposals for curriculum design. *South African journal of libraries and information science*, 69 (2): 108-114.

De Jager, K. and Nassimbeni, M. 2005. Information literacy and quality assurance in South African higher education institutions. *Libri*, 55 (1): 31-38.

Denscombe, M. 2010. *The good research guide: for small-scale social research projects*. McGraw-Hill.

Doyle, C. S. 1992. *Summary of findings: outcome measures for information literacy within the national education goals of 1990* (online). Available: http://files.eric.ed.gov/fulltext/ED351033.pdf (Accessed 16 June 2014).

du Bruyn, K. 2013. An exploratory framework for a study on designing a research focused advanced information literacy program for engineering postgraduates. *In: Proceedings of the IATUL Conferences*. South Africa, 14-18 April 2013. Cape Town: Cape Peninsula University of Technology, 1-12.

Dubicki, E. 2013. Faculty perceptions of students' information literacy skills competencies. *Journal of information literacy*, 7 (2): 97-125.

Education. 2001. *National plan for higher education* (online). Available: http://www.education.gov.za/LinkClick.aspx?fileticket=umHqDeAFo4A%3D&tabid=188&mid=498 (Accessed 16 June 2014).

Eisenberg, M. B. and Berkowitz, R. E. 1990. *Information problem-solving: the big six skills approach to library and information skills instruction*. New Jersey: Ablex Publishing Corporation.

Eisenberg, M. B. and Johnson, D. 2002. *Learning and teaching information technology computer skills in context*. New York: Eric Digest.

Eisenberg, M. B., Lowe, C. A. and Spitzer, K. L. 2004. *Information literacy*. Westport: Greenwood Publishing Group.

Feast, V. 2003. Integration of information literacy skills into business courses. *Reference services review*, 31 (1): 81-95.

Fidzani, B. T. 1998. Information needs and information-seeking behaviour of graduate students at the University of Botswana. *Library review*, 47 (7): 329-340.

Fisher, K. E., Erdelez, S. and McKechnie, L. 2005. *Theories of information behavior*. Medford: Information Today.

Fleming-May, R. and Yuro, L. 2009. From student to scholar: the academic library and social sciences PhD students' transformation. *Portal: libraries and the academy*, 9 (2): 199-221.

Fortune, A. E. and Reid, W. J. 1999. *Research in social work*. New York: Columbia University Press.

Fourie, I. and Bothma, T. 2006. Addressing the digital divide in teaching information retrieval: a theoretical view on taking students from ICT access to knowledge sharing. *The electronic library*, 24 (4): 469-489.

Fowler, F. J. 2013. *Survey research methods*. London: Sage.

Galpin, V. C. and Sanders, I. D. 2007. Perceptions of computer science at a South African university. *Computers and education*, 49 (4): 1330-1356.

Gbaje, E. S. 2007. Provision of online information services in Nigerian academic libraries. *Nigerian libraries: journal of Nigerian Library Association*, 40: 1-16.

Genoni, P., Merrick, H. and Willson, M. A. 2006. Scholarly communities, e-research literacy and the academic librarian. *The electronic library*, 24 (6): 734-746.

Gomersall, A. 2007. Literature searching: waste of time or essential skill? *Evidence and policy*, 3 (2): 8.

Green, R. and Macauley, P. 2007. Doctoral students' engagement with information: an American-Australian perspective. *Portal: libraries and the academy*, 7 (3): 317-332.

Gross, M. and Latham, D. 2007. Attaining information literacy: An investigation of the relationship between skill level, self-estimates of skill, and library anxiety. *Library and information science research*, 29 (3): 332-353.

Harkins, M. J., Rodrigues, D. B. and Orlov, S. 2011. "Where to start?": Considerations for faculty and librarians in delivering information literacy instruction for graduate students. *Practical academic librarianship: the international journal of the SLA academic division*, 1 (1): 28-50.

Harrington, M. R. 2009. Information literacy and research-intensive graduate students: Enhancing the Role of Research Librarians. *Behavioral and social sciences librarian*, 28 (4): 179-201.

Hart, G. and Davids, M. 2010. Challenges for information literacy education at a university of technology. *Innovation: journal of appropriate librarianship and information work in Southern Africa,*(41): 25-41.

Hazrati, H., Gavgani, V. Z. and Ghornanian, N. 2013. Determining information literacy competency of faculty members and post graduate medical and para medical students in using medical information resources. *Library philosophy and practice* (online), 1005.

Available: http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2424&context
(Accessed 14 June 2014).

Hill, J., Macheak, C. and Siegel, J. 2013. Assessing undergraduate information literacy
skills using project SAILS. *Codex: the journal of the Louisiana chapter of the ACRL*, 2 (3):
23-37.

Hodgens, C., Sendall, M.C and Evans, L. 2012. Post-graduate health promotion students
assess their information literacy. *Reference services review*, 40 (3): 408-422.

Hoffmann, K., Antwi-Nsiah, F., Feng, V. and Stanley, M. 2008. Library research skills: a
needs assessment for graduate student workshops. *Issues in science and technology
Librarianship*, 53: (1).

Houtman, E. 2010. " Trying to figure it out": Academic librarians talk about learning to
teach. *Library and information research*, 34 (107): 18-40.

Howie, S. J., Muller, A. and Paterson, A. 2005. *Information and communication
technologies in South African secondary schools*. Pretoria: HSRC Press.

Ivanitskaya, L. V., Hanisko, K. A., Garrison, J. A., Janson, S. J. and Vibbert, D. 2012.
Developing health information literacy: a needs analysis from the perspective of
preprofessional health students. *Journal of the medical library association*, 100 (4): 277.

Jankowska, M. A., Hertel, K. and Young, N. J. 2006. Improving library service quality to
graduate students: Libqual+ TM survey results in a practical setting. *Portal: libraries and
the academy*, 6 (1): 59-76.

Jiyane, G. V. and Onyancha, O. B. 2010. Information literacy education and instruction in
academic libraries and LIS schools in institutions of higher education in South Africa.
South African journal of libraries and information science, 76 (1): 11-23.

Johnson, T. P. and Wislar, J. S. 2012. Response rates and nonresponse errors in surveys. *JAMA*, 307 (17): 1805-1806.

Julien, H. and Boon, S. 2013. But are they learning anything? Outcomes assessment of information literacy instruction. In: Proceedings of *Proceedings of the Annual Conference of CAIS/Actes du congrès annuel de l'ACSI*. Canada, 1-6 November 2013, Montreal: Centre Sheraton, 181-191.

King, N. and Horrocks, C. 2010. *Interviews in qualitative research*. London: Sage.

Kingsley, K., Galbraith, G. M., Herring, M., Stowers, E., Stewart, T. and Kingsley, K. V. 2011. Why not just Google it? An assessment of information literacy skills in a biomedical science curriculum. *BMC medical education*, 11 (1): 17.

Kong, L. X., Hunter, S. and Lin, G. 2007. An advanced virtual program in engineering education for research and teaching excellence. *International journal of mechanical engineering education*, 35 (2): 148-165.

Lampert, L. 2005. "Getting psyched" about information literacy: A successful faculty-librarian collaboration for educational psychology and counseling. *The reference librarian*, 43 (89-90): 5-23.

Latham, D. and Gross, M. 2013. Instructional preferences of first-year college students with below-proficient information literacy skills: A focus group study. *College and research libraries*, 74 (5): 430-449.

Lawal, V., Underwood, P., Lwehabura, M. and Stilwell, C. 2010. Information literacy for higher education institutions in Nigeria and Tanzania: efforts and prospects for educational reform in teaching and learning. *Innovation: journal of appropriate librarianship and information work in Southern Africa,* (41): 42-61.

Leader, G. 2003. Lifelong learning: policy and practice in further education. *Education and training*, 45 (7): 361-370.

Liu, Z. 2006. Print vs. electronic resources: A study of user perceptions, preferences, and use. *Information processing and management*, 42 (2): 583-592.

Lwehabura, M. J. 2007. The status and practice of information literacy for teaching and learning in four Tanzanian Universities. MIS thesis. Pietermaritzburg: University of KwaZulu – Natal.

Machet, M. 2005. An evaluation of information literacy courses offered at a distance education University. *Mousaion*, 23 (2): 180-195.

Maree, K. 2007. *First steps in research*. Cape Town: Van Schaik Publishers.

Marshall, C. and Rossman, G. B. 2006. *Designing qualitative research*. California: Sage Publications.

Martin, A. and Rader, H. B. 2003. *Information and IT literacy: enabling learning in the 21st century*. London: Facet.

McRoy, R. G. 1995. Qualititative research. In: Edwards, R. L. ed. *Encyclopedia of social work*. 19th ed. Washington: NASW Press.

Miller, S. and Murillo, N. 2012. Why don't students ask librarians for help? Undergraduate help seeking behavior in three academic libraries. In: Duke, L. and Asher, A. ed. *College libraries and student culture.* Chicago: American Library Association. 49-70.

Mohammadi, E., Thelwall, M., Haustein, S. and Larivière, V. 2015. Who reads research articles? An altmetrics analysis of Mendeley user categories. *Journal of the association for information science and technology* (online). 66 (9): 1832-1846. Available: http://www.ost.uqam.ca/Portals/0/docs/articles/2014/JASIST_mohammadietal.pdf (Accessed 12 February 2015).

Moore, P. 2005. An analysis of information literacy education worldwide. *School libraries worldwide*, 11 (2): 1.

Mutula, S. M. 2005a. Bridging the digital divide through e-governance: a proposal for Africa's libraries and information centres. *The electronic library*, 23 (5): 591-602.

Mutula, S. M. 2005b. Peculiarities of the digital divide in sub-Saharan Africa. *Program: electronic library and information systems*, 39 (2): 122-138.

Naidoo, S. 2011. The impact of the digital divide on information literacy training of Extended Curriculum Programme students at the Durban University of Technology. M.Tech thesis. Durban: Durban University of Technology.

Nassimbeni, M. and de Jager, K. 2000. Training for access to global information. *Library management*, 21 (4): 192-197.

Neerputh, S. 2012. Academic integration of information literacy at the Durban University of Technology in preparing for lifelong learners. In: *The road to information literacy: librarians as facilitators of learning.* Berlin: De Gruyter Saur, 253-266.

O'Grady, T. and Beam, P. S. 2011. Postdoctoral scholars: A forgotten library constituency? *Science and technology libraries*, 30 (1): 76-79.

Ojedokun, A. A. 2007. *Information literacy for tertiary education students in Africa*. Ibadan: Third World Information Services Limited.

Ojedokun, A. A. 2014. Information literacy competence of librarians in South West Nigerian University libraries. *African journal of library, archives and information science*, 24 (1): 67-90.

Omeluzor, S. U., Bamidele, I. A., Onuoha, U. D. and Alarape, A. A. 2013. Information literacy skills among postgraduate students of Babcock University, Nigeria. *International journal of innovative research in management*, 12 (2): 1-19.

Palmer, S. and Tucker, B. 2004. Planning, delivery and evaluation of information literacy training for engineering and technology students. *Australian academic and research libraries*, 35 (1): 16-34.

Patterson, A. 2009. A needs analysis for information literacy provision for research: a case study in University College Dublin. *Journal of information literacy*, 3 (1): 5-18.

Pinto, M., Fernández-Ramos, A., Sánchez, G. and Meneses, G. 2013. Information competence of doctoral students in information science in Spain and Latin America: A self-assessment. *The journal of academic librarianship*, 39 (2): 144-154.

Ramzan, M., Munir, M. A., Siddique, N. and Asif, M. 2012. Awareness about plagiarism amongst university students in Pakistan. *Higher education*, 64 (1): 73-84.

Saunders, L. 2009. The future of information literacy in academic libraries: a delphi study. *portal: Libraries and the academy*, 9 (1): 99-114.

Saunders, L. 2012. Faculty perspectives on information literacy as a student learning outcome. *The journal of academic librarianship*, 38 (4): 226-236.

Sayed, Y. 1999. *The segregated information highway: information literacy in higher education*. Cap Town: Juta.

Sayed, Y. and de Jager, K. 1997. Towards an investigation of information literacy in South African students. *South African journal of library and information science*, 65 (1): 5.

Sentleng, M. P. and King, L. 2012. Plagiarism among undergraduate students in the faculty of applied science at a South African higher education institution. *South African journal of libraries and information science*, 78 (1): 57-67.

Somi, N. G. and De Jager, K. 2005. The role of academic libraries in the enhancement of information literacy : a study of Fort Hare library. *South African journal of libraries and information science* (online), 71(3): 259-267. Available: http://reference.sabinet.co.za/webx/access/electronic_journals/liasa/liasa_v71_n3_a5.pdf (Accessed 18 November 2014).

Streatfield, D., Allen, D. and Wilson, T. 2010. Information literacy training for postgraduate and postdoctoral researchers: a national survey and its implications. *Libri*, 60 (3): 230-240.

Thanuskodi, S. 2012. Use of online public access catalogue at Annamalai University library. *International journal of information science*, 2 (6): 70-74.

Thinyane, H. 2010. Are digital natives a world-wide phenomenon? An investigation into South African first year students' use and experience with technology. *Computers and education*, 55 (1): 406-414.

Tinio, V. L. 2003. *ICT in education*. United Nations development programme-Asia Pacific Development Information Programme.

Ullah, M. and Ameen, K. 2014. Current status of information literacy instruction practices in medical libraries of Pakistan. *Journal of the medical library association*, 102 (4): 281.

Vahed, A. 2014. Ensuring the quality of pedagogy through games in dental technology at a selected University of technology. D.Tech, Durban University of Technology.

Waema, T. 2002. *ICT human resource development in Africa: challenges, strategies, and options*. Nairobi: African Technology Policy Studies Network.

Wainwright, E. J. 2005. Strategies for university academic information and service delivery. *Library management*, 26 (8/9): 439-456.

Webber, S. and Johnston, B. 2000. Conceptions of information literacy: new perspectives and implications. *Journal of information science*, 26 (6): 381-397.

Wisker, G. 2007. *The postgraduate research handbook: succeed with your MA, MPhil, EdD and PhD*. New York: Palgrave Macmillan.

Woodcock-Reynolds, H. J. 2011. The use of browser based resources for literature searches in the postgraduate cohort of the faculty of humanities, development and social sciences (HDSS) at the howard college campus of the University of KwaZulu-Natal. PhD, University of KwaZulu-Natal, Durban.

Zinn, S. E. 2000. Outcomes-based education and non-English mother tongue speakers from disadvantaged environments: a double-edged handicap to acquiring information literacy. *Mousaion*, 18 (2): 40-53.

Appendices

Appendix 1: Informed Consent

Dear Participant,

My name is Mousin Omarsaib 211547106 (*student nr*). I am a Honours / **Masters** / PhD candidate studying at the University of KwaZulu-Natal, Howard College / Pietermaritzburg Campus. The title of my research is: **Information literacy skills of postgraduate students in the Faculty of Engineering at the Durban University of Technology**. The aim of the study is to identify what the information literacy skills of postgraduate engineering students at the DUT are. On the basis of the findings recommendations will be made on information literacy interventions that are needed to ensure that students entering the postgraduate level of their studies are better equipped with information literacy skills. I am interested in interviewing you so as to share your experiences and observations on the subject matter.

Please note that:
- The information that you provide will be used for scholarly research only.
- Your participation is entirely voluntary. You have a choice to participate, not to participate or stop participating in the research. You will not be penalized for taking such an action.
- Your views in this interview will be presented anonymously. Neither your name nor identity will be disclosed in any form in the study.
- The interview will take about 30 minutes.
- The record as well as other items associated with the interview will be held in a password-protected file accessible only to myself and my supervisors. After a period of 5 years, in line with the rules of the university, it will be disposed by shredding and burning.
- If you agree to participate please sign the declaration attached to this statement (a separate sheet will be provided for signatures)

I can be contacted at: School of Social Sciences, University of KwaZulu-Natal, Pietermaritzburg Campus, Scottsville, Pietermaritzburg. / Howard College Campus, Durban. Email: m o u s i n o @ d u t . ac . za
Cell: 0711933619
My supervisor is Mr A Leach who is located at the School of Social Sciences, Pietermaritzburg Campus / Howard College Campus, Durban of the University of KwaZulu-Natal. Contact details: email Leach@ukzn.ac.za Phone number: (033) 260 5098.

My co-supervisor is ………………….. who is located at the School of Social Sciences, Howard College Campus/ Howard College Campus of the University of KwaZulu-Natal. Contact details: email ………………………… Phone number: …………………………..

The Humanities and Social Sciences Research Ethics Committee contact details are as follows: Ms Phumelele Ximba, University of KwaZulu-Natal, Research Office, Email: ximbap@ukzn.ac.za,Phone number +27312603587.

Thank you for your contribution to this research.

DECLARATION

I………………………………………………………………… *(full names of participant*) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire. I understand the intention of the research. I hereby agree to participate.

I consent / do not consent to have this interview recorded (if applicable)

SIGNATURE OF PARTICIPANT   DATE

…………………………………………………………………………………………

Appendix 2: Postgraduate engineering students questionnaire

Information literacy skills of postgraduate students in the Faculty of Engineering at the Durban University of Technology

Please answer all questions as completely as possible by indicating your option by **placing a cross (X) in only one of the boxes unless otherwise stated.** Confidentiality is assured.

1. For the purpose of this study, please indicate your race (for statistical reasons):

Race	(X)
African	
Coloured	
Indian	
White	
Other (Please specify)	

2. Please indicate your level of study.

Level of postgraduate study	(X)
Masters	
Doctorate	
Post-Doctoral	

3. Did you attend information literacy instruction during the undergraduate levels of your study at DUT?

Information literacy instruction at undergraduate studies	(X)
I did attend information literacy instruction in my undergradute level of studies at DUT	
I did not attend information literacy instruction in my undergraduate level of studies at DUT	
I am unsure whether I attended information literacy instruction in my undergraduate level of studies at DUT	

4. Did you attend information literacy instruction during the undergraduate levels of your study **at any other institution**?

Level of Information literacy instruction at undergraduate studies	(X)
I did attend information literacy instruction in my undergraduate level of studies	
I did not attend information literacy instruction in my undergraduate level of studies	
I am unsure whether I attended information literacy instruction in my undergraduate level of studies	

5. How prepared were you for postgraduate research in terms of being able to effectively access and use the information resources available via the DUT Library for your study?

Extent of preparedness	(X)
Considerably prepared (to a notably large extent being able to access and use information resources effectively)	
Adequately prepared (satisfactory or acceptable to access and use information resources effectively)	
Not prepared at all	

Level of familiarity with extent of information needed

6. Please identify and select the keywords by placing an (X) in **one** of the boxes to help analyse the topic on *"Discuss the status and future of engineering mathematics in South Africa."*

Analysis of topic	(X)
Engineering mathematics, South Africa	
Discuss, status, future, South Africa	
South Africa, engineering mathematics, status, future	
Discuss, future, status, engineering mathematics	

7. When conducting research, as part of forming a search strategy, the researcher has to**:**

Search strategy	(X)
Locate books using the DUT library's online catalogue or discovery tool (Summon)	
Search a computer database for articles	
Analyse the topic to identify synonyms or alternate keywords/concepts	
Check the Internet for background information on your topic	

8. You are writing a research paper on *"Production management and the impact of industrial engineering in the 21st century."* If your search strategy is to start with a broad overview and then narrow your topic, in which order would you look at these sources?

Analysis of topic	(X)
First dictionaries, encyclopaedia's, books, and then research articles	
First books, research articles, dictionaries and then encyclopaedia's	
First research articles, dictionaries, books, and then encyclopaedia's	
First encyclopaedia's, dictionaries, research articles and then books	

Level of familiarity of accessing information

9. To locate books within the DUT Library collection, you should use

DUT Library collection	(X)
Google	
An online database	
DUT library online catalogue	
UKZN library online catalogue	
Summon and DUT library online catalogue	

10. When trying to search using the DUT Library catalogue, you typed in the words: "engineering design." The search did not produce any results. What do you do next? **(You may select more than one response).**

DUT Library catalogue	(X)
Use a different computer or terminal	
Identify a synonym for engineering design	
Put quotes around the phrase "engineering design"	
Go to a different library or surf the web	

11. When searching in an academic database, the use of Boolean/search operators ("AND", "OR" and "NOT") can be useful in narrowing or broadening your search results. Which words would you use to broaden the number of the sources you will retrieve for the search below?

Boolean operators	(X)
South Africa OR engineering	
South Africa AND engineering	
South Africa NOT engineering	
Systemization instead of engineering	

12. If you type "engine" into a database search, what type of search results would you likely get?

Database search	(X)
Articles that only focus on engineering	
Articles only on engine control modules	
All articles that contain terms such as engineering, engine control modules and engineering analysis	
Articles only relating to engine	

13. Which is the best place to find research published articles by scholars, experts or professionals?

Research articles	(X)
On amazon.com	
In the newspapers	
In general interest magazines	
In scholarly journals	

Level of experience in evaluating information and its sources critically

14. How do you know if someone is an authority on engineering thermodynamics? (**You may select more than one response).**

Authority (expert) in a specified field e.g. engineering thermodynamics	(X)
The individual has their own website	
The individual uses technical jargon that most readers won't understand	
Numerous articles on engineering thermodynamics cite the individuals work	
The individual has a PhD in engineering thermodynamics	
The individual has published extensively in the field	

15. What would you assume is the primary purpose of the Engineering Council of South Africa (https://www.ecsa.co.za/) website?

Evaluating a website	(X)
To present personal opinions on engineering matters to South Africans engineers	
To disseminate the authoritative research on engineering so that it can be integrated into practice at workplace level	
To sell engineering designs and equipment's to the South African public	
The accreditation of engineering programmes, registration of persons as professionals in specified categories and the regulation of the practice of registered persons	
To provide information on issues such as accreditation of engineering programmes for tertiary institutions, membership, regulations of engineering practice etc.	

16. In critically evaluating information sources indicate which of the following you should consider:

Evaluating information sources	(X)
The currency of the information	
The credentials of the author	
The relevancy of the information source	
The accuracy of the information	
All of the above	
None of the above	
Don't know	

Level of experience in incorporating selected information into one's knowledge base

17. What is "peer reviewed"?

Academic value of a research work	(X)
A system of revision carried out by the South African Department of Education under the supervision of the relevant authorities in education	
Peer-reviewed publications have been evaluated by several researchers/subject specialist with credentials in the field related to the publication or in the academic community prior to it being accepted for publishing. It is also knows as scholarly or refereed publications.	
A process of guaranteeing that all articles are hundred percent true by having experts read them before they are published	
A process for examining research material and checking using a microscope	

Please use the information given below to answer questions 18-20.

Sheng, S. 2014. Wind turbine condition monitoring: a scholarly perspective. *Wind Energy*, 17 (5): 671-672

18. What is the title of the journal?

Title of the journal	(X)
Wind turbine condition monitoring	
Wind turbine condition monitoring: a scholarly perspective	
Wind Energy	
A scholarly perspective	

19. What is the title of the article?

Title of the article	(X)
Wind turbine condition monitoring: a scholarly perspective	
Wind Energy	
Wind turbine condition monitoring	
A scholarly perspective	

20. What is the volume number of the journal?

Volume number of the journal	(X)
671-672	
17	
5	
2014	

Level of experience in using information effectively to accomplish a specific purpose

21. What does the Harvard style of referencing signify?

Referencing	(X)
Library classification systems	
A format to document sources used for a research paper	
Call numbers	
Article indexes	
Shelf numbers of books	

22. What is a reference list?

Reference list	(X)
A list of sources used in preparing a paper	
The full-text of the document	
An outline of the article	
A list of the academic sources referred to in a scholarly work, typically printed as an appendix	

23. Why should you include citations in your research? **(You may select more than one response).**

Citations	(X)
Citations allow you to locate and read the sources yourself	
Citations give credit to the author	
Citations allow readers to determine the credibility of your sources	
To avoid committing plagiarism	

Level of experience in understanding the legal and ethical use of information

24. Copying text from a website without identifying the source is regarded as

Inappropriate use of information	(X)
Fair use	
Plagiarism	
Acceptable use because everyone does it	
A copyright violation	

25. Which concept below makes it legally wrong to reproduce a substantial portion of the work of another person without permission?

Protection by law for an individual's work	(X)
Freedom of information	
Copyright	
Fair use	
Intellectual freedom	

26. Which of the following formats of intellectual property are covered by copyright?

Protection by law for a work produced	(X)
Architecture e.g. building designs	
Computer programs	
Movies	
Songs	
Some of the above	
All of the above	
Don't know	

Thank you for your time and effort in contributing to this study by completing this questionnaire. Please hand your completed questionnaire to the researcher when you have finished.

Mr Mousin Omarsaib

Subject Librarian: Engineering

DUT Libraries

Durban University of Technology

E-mail: mousino@dut.ac.za

Tel.: 031 3732356

Appendix 3: Postgraduate librarian interview schedule

1. What is your designation?

2. What are your academic qualifications relating to your role as a postgraduate librarian?

3. Since when (which year) have you been the postgraduate librarian at the DUT?

4. Outside of your current role as a postgraduate librarian do you have other experience relating to information literacy?

5. What is your understanding of information literacy in the current South African higher education context?

6. Do you believe that the gap in information literacy is a result of lack of emphasis at school level?   Please elaborate.

7. Do you believe that students at undergraduate levels of their studies at DUT lack information literacy skills?

8. Is there a pattern or trend of this continuing at postgraduate level?

9. In what areas specifically do you see the information literacy skills of students lacking?

10. Do you believe the objectives of IL training in the current situation at DUT is being met? Please explain.

11. Does the DUT information literacy instruction design cater for the research support as required by postgraduate students? Please elaborate.

12. Are there any other comments that you would like to make with regard to the issues raised in this interview?

Thank you for your time and effort in contributing to this study.