



**POSTGRADUATE STUDENT SUCCESS RATE WITH FREE-FORM
INFORMATION SEARCHING**

by

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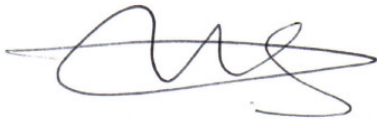
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ABSTRACT

The Internet has become a useful instrument in connecting users, regardless of their geographical locations, and has thus made the world a small village where users can interact and search for information. Another aspect that has made the Internet popular amongst users, is its growing popularity as a global resource connecting millions of users surfing the Web daily, searching for and sharing information. A successful search for information depends on the user's ability to search effectively, and this ability is based on computer competency, knowledge of Information Technology (IT), perceptions of IT usage, and the demographics of the user. These user's characteristics tend to influence the overall user experience. Although the Internet is used by different groups of users to achieve different objectives of information search, not all of them achieve these objectives.

The main aim of this study was to determine the success rate of post-graduate students using free-form information searching to find academic reference materials.

Following a pilot study which indicated that the search success rate amongst postgraduate students is low, the survey method was used to collect primary data for the entire research project. The pilot study confirmed the definition of the research problem. Data was collected from Cape Peninsula University of Technology (CPUT) postgraduate students. CPUT is the only university of technology in the Western Cape. A quantitative questionnaire, based on SurveyMonkey, was used for data collection and analysis.

The findings of this study indicated that the postgraduate student search success rate has a lower than expected value when using free-form searching for academic information. Furthermore, although postgraduate students are moving away from the single-term-searching-syndrome, their success rate is still unacceptably low. However, this outcome is not surprising as the volume of Internet search is changing incrementally and this ever-growing information source has made it difficult to ascertain the quality and authenticity of information that is available to the users. Therefore, postgraduate students were found to be wasting a lot of time on fruitless searching, which affected their progress.

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DEDICATION

I dedicate this work to my parents, who nurtured my potential, my beloved husband Dr Mathias Twizeyimana and to my brother Christian Hitimana.

RESEARCH OUTPUTS

The author produced the following research outputs during this study.

Output	Authors	Title	Institution/Event/Journal	Status
Journal Article	Uwimana, I., Weideman, M. & Richards, M.	Student use of free form searching for academic references	Online Information Review	Submitted for review 2016.
Conference Paper	Uwimana, I., Xyda, A., van de Bosch, B., Hemati, S., Bader, B. I. & Milosheva, N.	The Impact of social media on HR	Vrije Universiteit Amsterdam	October 2011, Unpublished.
Poster	Uwimana, I., Weideman, M. & Richards, M.	Postgraduate student success rate with free-form information searching	13 th Annual Conference on World Wide Web Applications	Published: http://web-visibility.co.za/website-visibility-digital-library-seo/
Poster	Uwimana, I., Weideman, M. & Richards, M.	The use of academic databases by postgraduate students	12 th Annual Conference on World Wide Web Applications	Published: http://web-visibility.co.za/website-visibility-digital-library-seo/

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GLOSSARY

Terms/Acronyms/Abbreviations	Definition/Explanation
Academic research	Search for knowledge with an open mind to establish facts.
Body Text	Described as the textual content of the website or the webpage content.
Database	Consists of an organised collection of data for one or more uses and intended to enable the retrieval of large amounts of data easily.
Database searching	A database uses a system of fields and records to tightly organise and structure information - those fields and records are used to enable users to search for and find relevant information.
Epistemology	The study of knowledge which investigates the origin, structure, methods and validity of knowledge.
Free-form searching	The use of search engines to find stored data on the World Wide Web.
Internet	An interconnection of computer networks that provide information to users globally.
Meta Search engine	Allows users to enter a search query once and access several search engines simultaneously. It sends user requests to several other search engines and/or databases and aggregates the results into a single list.
Ontology	The theory of objects and ways that objects can be related to one another or parameters that objects can have and share.
Postgraduate student	A student who has obtained a basic degree from a university and is pursuing studies for a more advanced qualification.
Search behaviour	A user's methodology of sourcing or seeking information for personal use, knowledge updating, and development.
Search engine	A service that allows an Internet user to enter a keyword or phrase to search for information. The

	search engine displays results on its search engine result page.
Search engine optimisation	The practice of using different techniques to optimise the content of a website to earn a high search engine ranking on its results page.
Search query	A query that a user submits to the search engine to satisfy user information needs.
Social network	Allows users to connect by creating personal information profiles, inviting friends and colleagues to have access to those profiles, and sending emails and instant messages between each other.
Success Rate	The number of times an information searcher finds exactly what is required, expressed as a percentage of the total number of times searched for similar information under similar conditions. This percentage was calculated as the total number of successful searches on the web over the total number of searches.
User	Reference to a human (end-user) who uses the Internet for different reasons without complete technical expertise required to understand the system entirely.
Web Directory	Provides a service that allows a user to navigate through several lists of websites, compiled and selected by human editors through categorisation, per subject or topic.
Website visibility	The degree to which a website can be found and indexed by search engine crawlers.
World Wide Web (WWW)	An easy to use system that links information (text, pictures and sound) across the Internet.

CHAPTER ONE

BACKGROUND AND RESEARCH PROBLEM

1.1 Introduction

The Internet has rapidly become an important and widely available tool used routinely for a vast variety of purposes by many people. However, most users find it difficult to retrieve relevant information from the Internet as its lack of organisation and overwhelming size delay or prohibit users from accessing useful and relevant information (Velez & Xiang, 2011; Weideman, 2009).

Although the WWW is the largest information repository in the world as information on numerous topics can be found on the Web, searching for appropriate information can be turned into an arduous and frustrating task for some users. Furthermore, using the World Wide Web (WWW) makes effective and efficient searching for the right information on the Web a key challenge (Xue, Zhou & Zhang, 2008). Effective and efficient are very common business/marketing terms and most people including researchers tend to mix their meanings and usage occasionally. These two terms have similar definitions in most dictionaries, however, a few dictionaries have defined them correctly; *effective*: adequate to accomplish a purpose; producing the intended or expected result while *efficient*: performing or functioning in the best possible manner with the least waste of time and effort. Furthermore, in order to provide clarity with the difference in meanings, the researcher used this sentence: *“Being effective is about doing the right things, while being efficient is about doing things in the right manner”*.

This research focused on the segment of the student population who is involved in actual research. This is namely postgraduate students at the Cape Peninsula University of Technology (CPUT) who engage in the process of resource hunting effectively and efficiently when searching for information, using free-form academic information searching. Free-form searching is the use of search engines to find stored data on the World Wide Web. In this study term “free-form” refers to the use of a search engine to find information, as opposed to utilising an academic database.

1.2 Background of research problem

The growing popularity of the search engines and the users’ increasing need for relevant and timely information have highlighted a change in our perceptions of information literacy in the traditional library-based approach.

Information literacy skills are based on library skills and information technology skills (Ranaweera, 2010). However, this liberation from dependency on an intermediary in the search process seems to have decreased the general success rate of free-form searching (Weideman, 2001). In a study conducted by Weideman (2001) based on Internet searching as a study aid for information technology and information systems, it was confirmed that in searching for academic information, 32% of undergraduate students obtain the information on the Internet within a 30-minute period. Therefore, this and as well as previous research demonstrates that students generally have a low success rate when searching for academic information using search engines (Hölscher & Strube, 2000; Hansen, Derry, Resnick & Richardson, 2003; Wisniewski, 2010). However, none of these studies have been found which focus on post-graduate students specifically. Since the sample taken from the population of students was only post-graduate students, for this study it was considered necessary to do a pilot study with this specific focus. The participants of the pilot study were carefully chosen to ensure that none of them would be part of any other experiment to be done during this research project. This trend was confirmed during a pilot study at CPUT. A sample of postgraduate students from CPUT constituted the pilot study, and the purpose of the pilot study was to confirm the existence of the research problem (success rate) in the use of free-form information searching by students to find academic reference materials. The pilot study was conducted by providing online questionnaires to determine the frequency of search engine usage, the amount of time postgraduate students spend to search for one academic reference, and the success rate when searching for academic information. The questionnaire was hosted on the SurveyMonkey website. Purposive convenience sampling was adopted in the selection of respondents for this pilot study.

1.3 Statement of research problem

The problem to be investigated during this study is defined as:

There is no clarity of what a typical success rate is with free-form searching for study materials by post-graduate students, where a low success rate will be counter-productive.

1.3.1 Research matrix

The research matrix is a system of rows and columns into which the components of a research project fit, including the objectives and methods of analysis (Choguill, 2005). This research focussed on the free-form information searching used by Cape

Peninsula University of Technology (CPUT) postgraduate students to find academic reference materials. The success rate was the percentage of times the information searcher found what was required. This percentage calculation was based on the total number of successful searches and the total number of searches.

Research problem	There is no clarity of what a typical success rate is with free-form searching for study materials by post-graduate students, where a low success rate will be counter-productive.	
Research question	What is the success rate of postgraduate students with free-form Internet information searching?	
Research sub-questions	Research method	Objectives
What are the challenges being faced by free-form searchers?	Literature review	To define free-form information searching and to identify the challenges affecting its use.
Which search engines are used by postgraduate students, how is the search done (the query length) and what is the quality of their results?	Questionnaire analysis	To identify the search engines used by the participants, the query length specified and the result quality.

Table 1. 1: Research matrix

1.4 The purpose of the study

The purpose for this research was to study the use of free-form information searching by CPUT post-graduate students to find academic reference materials, and to determine the postgraduate students' success rate with free-form Internet information searching.

1.5 Research design and methodology

This study made use of the quantitative research design because it enabled the researcher to draw statistical inferences, as well as empirical conclusions on the factors contributing to the low rate of success when using free-form searching. Purposive sampling was applied for the selection of the respondents and online questions were used, utilising SurveyMonkey type questionnaires for data collection and analysis.

1.5.1 Ontological stance

Ontology explores the way in which the researcher, as the observer, may acquire knowledge (Nel & Com, 2007). In this regard the researcher seeks to identify the search engines used by CPUT postgraduates, the query length used and the quality of their results in trying to acquire information for their academic research, using free-form searching.

Corazzon (2009) states that ontology is the theory of the objects and their ties. Ontology provides criteria for distinguishing various types of objects “(concrete and abstract, existent and non-existent, real and ideal, independent and dependent)” and their ties “(relations, dependences and predication)”. The elements for this research, includes free-form information searching, database searching, searcher behaviour, searching success rate and postgraduate students.

1.5.2 Epistemological stance

According to Steup (2010) epistemology is defined as the study of knowledge and justified belief. As the study of knowledge, epistemology is concerned with the following questions: What are the necessary and sufficient conditions of knowledge? What are its sources? What is its structure, and what are its limits? During this study, the researcher utilised a methodology that considered the researcher to be an outsider and a positivist/realist (quantitative) approach was used with an online questionnaire, using a Survey Monkey type questionnaire that highlighted free-form searching usage by postgraduate students.

In this research project, the study explores the use of free-form information searching by students to find academic reference materials. The researcher took an objective and detached epistemological stance. As a result, the sources used for this research are free-form Internet searching and postgraduate students.

1.5.3 Conceptual Framework

A conceptual framework, according to Perez and Anthony (1995), is a map of concepts and their relationships. More specifically, it describes the aspects of the significance of the research (entities) and characteristics of, and associations between, pairs of those aspects of significance (relationships). For this study CPUT Postgraduate students were the target group, and a literature review had to be conducted to identify the current status of the literature in the field of free-form Internet searching success rate. Furthermore, a quantitative method was utilized using an online questionnaire so that the researcher could analyse statistically and

identify the status report on the success rate with free-form academic searching by postgraduate students.

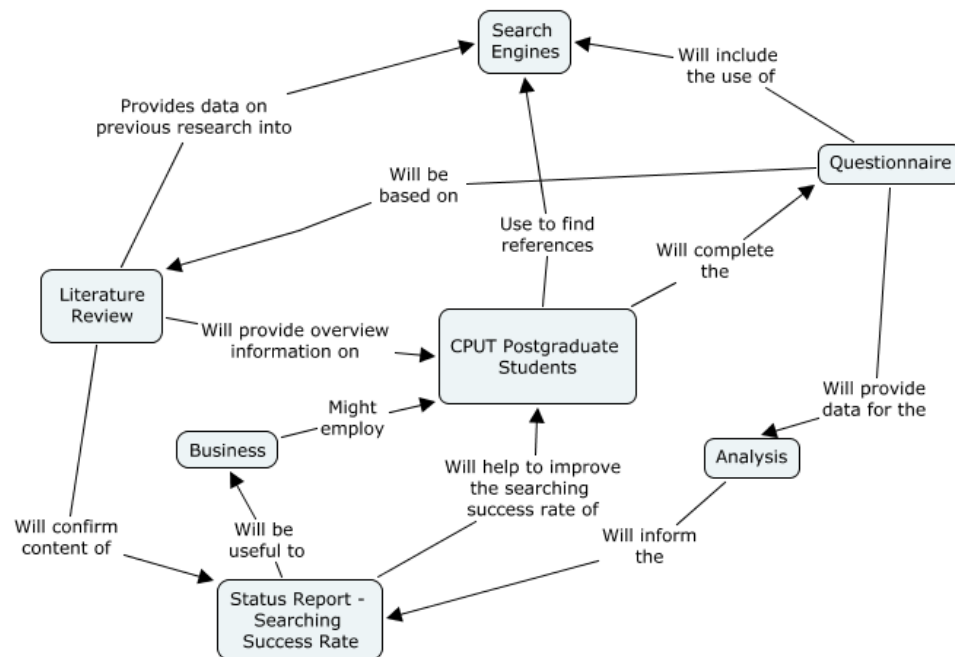


Figure 1. 1: Figure Research Framework

Figure 1.1 depicts a conceptual framework of the elements of this research and their relationships to success rates when using free-form searching to find academic reference materials by postgraduate students at CPUT. According to this conceptual framework it is clear that after gathering information from questionnaires and the literature review, this study would be able to contribute to insight into the use of free-form information searching. It will also be possible to determine the postgraduate students' success rate with free-form Internet information searching. The questionnaire was designed to address success rate specifically, by requesting participants to indicate whether or not they have been successful in their searching endeavours.

1.5.4 Questionnaires and pilot study

A pilot study was conducted, and its intention was to collect data to prepare for a larger, more definitive study. It was to provide the researcher with ideas, approaches, and clues which could assist with the major study. As was previously mentioned, the pilot study was conducted by the researcher to confirm existence of the research problem (see Section 3.1.1). The results of the pilot study amongst a small sample indicated that most these students (58.3%) found the information they required

between 50% and 79% of the time, and only 25% obtained the information that they were looking for between 30% and 49% of the time. The minority of these students (16.7%) attained the required information between 80% and 99% of the time.

A questionnaire was designed and hosted to obtain data on the following topics:

- Determining whether the respondents have made use of Internet search engines when searching for academic references.
- Obtaining the respondents' search engine services used.
- Furthermore, the author intended to determine the success rate of the inspected research results.

Leedy and Ormrod (2005:132) identified two main research design methods, namely qualitative and quantitative. In this research it is appropriate to use the quantitative approach. A quantitative research signifies the use of numbers to explain and predict a phenomenon. It is representative and can be conducted on a large sample. Furthermore, a quantitative method facilitates high levels of reliability of gathered data and the researcher's own biases and subjective preference in the quantitative methods are irrelevant.

The research was conducted by providing online questionnaires, identifying CPUT postgraduate students through faculties, contacting students via supervisors, motivating them to complete the questionnaires and by summarising the results. Data was collected and analysed using standard instruments such as: questionnaires, graphs were used to highlight trends and trends were analysed.

1.5.5 Results and Conclusions

The researcher set out to establish the degree of success achieved by free-form Internet searchers. The researcher designed an online questionnaire. The participants were asked to respond to questions which would assist the researcher in assessing how they perceive free-form searching when they need information for their academic reference materials. The questionnaire consisted of 14 multiple-choice questions (see Appendix B).

The final results indicate that Google was the most popular search engine utilised. Around one-half of the participants (50.4%) found the information they were looking for and their success rate ranged from 50% to 79%. This was considered to be unacceptably low. Also, 31.3% of the participants used more than five words per

search (the longest), whereas the average used three words per query. This was a positive trend.

1.6 Delineation of the research

The research focussed on postgraduate students enrolled at CPUT. The research area covered all Campuses namely: Bellville, Cape Town, Granger Bay, Mowbray and Wellington.

- Prior to this study, the researcher applied for ethical approval from the research department. The ethical approval clarified the aims, process and outputs of the research.
- The respondents in this study were assured that all information received would be treated as strictly confidential and all responses would be used for academic purposes.
- This research investigated usage of free-form searching by postgraduate students and it was stated that the sample of postgraduate students had to be computer literate and have used a search engine before.
- The focus of SurveyMonkey was used for data collection and analysis with descriptive statistics to identify what the factors were which contributed to the low rate of success when using free-form searching.

1.7 Overview of chapters

- **Chapter 1:** This chapter outlined the research design and methodology of the study. The introductory literature review focused on the historical background of free-form information searching. Subsequently, a problem statement relating to the success rate when using free-form information searching was formulated.
- **Chapter 2:** In this chapter, the researcher explored previous related studies and presents an overview of the literature in the field of free-form searching success rate.
- **Chapter 3:** This chapter discusses the tools and methods to be used for data gathering.
- **Chapter 4:** In this chapter the presentation and analysis of data gathered for the research is discussed.
- **Chapter 5:** A conclusion was drawn based upon the data analysis, linking it to the problem statement of the subject under investigation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents an overview as well as the status of the literature in the field of free-form Internet searching success rate. Literature searching is a systematic and thorough search of all types of published literature to identify as many items as possible that are relevant to a topic (Gash, 2000:1). A synthesis of the literature is done to develop a reference against which the integration of the use of searching behaviour and the searching success rate of academic literature by postgraduate students at CPUT can be determined. Literature is examined to investigate the users' actions and their cognitive understanding of acquiring information from the Internet. A more complete understanding of the way in which users acquire and use Web information is therefore necessary.

The chapter is organised as follows: the definition of Internet in the context of this study is presented as well as an assessment of its usage to acquire the information; postgraduate students and the challenges they face in achieving their success rate when using free-form Internet searching are discussed together with factors that contribute to the usage of free-form Internet searching.

2.2 The Internet

2.2.1 Definition of the Internet

The Internet has become an information and communication medium that has been integrated into our everyday lives. Rumsey (2004:154-155) stated that the Internet is a multiplex of networks comprising of elements such as:

- email;
- discussion groups and newsgroups;
- the World Wide Web (WWW) and
- a means of file transfer.

Schneider and Evans (2007) identifies the Internet as a specific worldwide collection of interconnected networks whose owners have voluntarily agreed to share resources and network connections. Laing and Powling (2002:8) describe Internet content as the collection of millions of webpages containing a wide range of information. The Internet is an infrastructure of information whereby webpages are stored on Web servers (Visser, 2006); these servers run specialised software which enables

information to be transmitted over the Internet. For this study, the terms “Internet” and “Web” will be used interchangeably.

2.2.2 Internet background

The Internet is a global resource connecting millions of users. It originated as an experiment over 20 years ago by the United States in its Defence Department and was designed to link defence contractors and researchers (Boys & Irani, 2004:191). However, Internet usage spread beyond military communities into other spheres of society including universities, where it has become a powerful tool for academic research. Tim Berners-Lee designed a system to facilitate collaborative working within his organisation and it was the expansion of this which led to the birth of the World Wide Web (WWW).

The population of Internet users has continually increased, as the Internet supplies users with numerous information enrichment opportunities. It also provides a mechanism for information dissemination and collaborative interaction between users and their computers all over the world (Leiner, Cerf, Clark, Kahn, Kleinrock, Lynch, Postel, Roberts & Wolff, 2000; Singh, 2002). From 2000 to 2010 the number of Internet users increased by 444.8%, equating to over one billion (Anon, 2010). Asia still has the highest number of Internet users, as reflected in Table 2.1. Africa, on the other hand, has the lowest percentage of users at 10.9% of the world population.

World Regions	Population (2010 Est.)	Internet Users Dec. 31, 2000	Internet usage	Penetration Population %	Growth 2000-2010	Usage %
Africa	1,013,779,050	4,514,400	110,931,700	10.9	2,357.3	5.6
Asia	3,834,792,852	114,304,000	825,094,396	21.5	621.8	42.0
Europe	813,319,511	105,096,093	475,069,448	58.4	352.0	24.2
Middle East	212,336,924	3,284,800	63,240,946	29.8	1,825.3	3.2
North America	344,124,450	108,096,800	266,224,500	77.4	146.3	13.5
Latin America/ Caribbean	592,556,972	18,068,919	204,689,836	34.5	1,032.8	10.4
Oceania/ Australia	34,700,201	7,620,480	21,263,990	61.3	179.0	1.1
WORLD TOTAL	6,845,609,960	360,985,492	1,966,514,816	28.7	444.8	100.0

Table 2. 1: Internet World Stats/World Internet usage and population statistics

(Source: Anon, 2010)

Today, the Internet and WWW are positioned as the main sources of information for students, which emphasises how Web searching has become one of the most active information access tasks in higher education. Sangster (1995) stated that:

“The World-Wide Web represents a new concept in technology, the library on your desktop, the dictionary at your fingertips, the sound at your ear. There is nothing that we hear or see that will not be available through WWW”.

The WWW is undoubtedly a valuable research tool. Moreover, all graduate students reported that they searched the university library intranet or the Internet for their studies (George, Bright, Hurlbert, Linke, St. Clair and Stein (2006). The mechanism that passes information between computers on the Internet can be used in exactly the same way over local networks such as those used at the university or offices, and when it is not publicly accessible, it is called an intranet (Buckley & Clark, 2007). In a study of postgraduate students in a tertiary institution, Jagboro (2003) reports that students use the Internet mostly for research purposes; the aforesaid claim is supported by Ibegwam (2004), who notes that the majority of the students use the Internet for academic purposes in similar studies. The vast amount of information on the Internet continues its trend to grow exponentially (Zhang & Dimitroff, 2005).

According to Weideman and Kritzing (2003:231), the amount of data available on the Internet cannot be measured and the users still need to do Internet searching in order to access information.

Harmon and Jones (1999) present five levels of Internet use in education. These levels are commonly used in schools, colleges and universities, corporate training for professional students and also for immersive Internet use. De Villiers (2001) produced a summary (see Table 2.2) for the level of Web usage and provides a description of each.

Level of Web use		Description
1	Informational	Provides stable information to the learner. Administrative in nature. Consists of the instructor placing items such as the syllabus, course schedules and contact information on the Web for learners to review. Requires little or no daily maintenance, and takes up minimal space and bandwidth.
2	Supplemental	Provides course content information for the learner, functioning as an addendum to the core content. Main part of educational experience is provided in a classroom setting. Instructor places course notes on the Web. This should be done after class, otherwise class attendance will drop. Requires more technical know-how by the instructor, daily or weekly maintenance, and low to moderate space and bandwidth.
3	Essential	Requires the instructor to have HTML skills and information literacy skills along with ample course development time. Learner obtains most, if not all, of the course content information on the Web. Classes still meet face-to-face, but learners are expected to use the web-based course materials extensively. Require learners to take a more proactive approach to ensure their own learning.
4	Communal	Classes meet both face-to-face and online. Learners generate course content themselves. Requires the use of other online tools, such as chat rooms, bulletin boards, email, and video. Requires both instructor and learners to have good HTML skills as well as effective technology skills in general. Online group collaboration tools are not as user-friendly and “bug-free” as one might hope and novice technology users might not be able to get past the frustrations of imperfect tools to get to meaningful interaction about the course content.
5	Immersive	All of the course content and interactions occur online. This level should be seen as a sophisticated, constructivist virtual learning community. Comprised of learner-centred, constructivist pedagogies. Instructor and learners must have a high level of technical expertise and sophisticated learning strategies.

Table 2. 2: Five levels of Internet use in education
(Source: Harmon and Jones, 1999; De Villiers, 2001)

2.3 Internet searching

The Internet is an important tool which plays a role in assisting the access of information resources, which increases exponentially. This can be attributed to the steady increase in Internet usage for education and research purposes (Teo, 2010; Edwards & Bruce, 2002). Because of the growth in volume and the continuous development of more sophisticated searching tools, there is now the possibility of obtaining information and answers to real questions. These ever-growing information sources have made it difficult to ascertain the quality and authenticity of such information. Although there is a large amount of high quality information freely available, there is also much dubious material. Skill is required to distinguish between the two (Rumsey, 2004:155). Therefore, the availability of information is no longer a guarantee for finding the correct information, as an information searcher needs to have basic skills to find relevant information on the Internet. The information magnitude is immeasurable and there is no single categorisation scheme in place to facilitate easy access to this data.

Free-form information searching in this research is based on the use of Internet search engines to retrieve information on the Web. Information searching refers to people's interaction with information retrieval systems, ranging from adoption of a search strategy to judging the relevance of information retrieved (Wilson, 2000; Ovchenkova, 2011). The term "search" denotes the specific behaviours of individuals engaged in locating information (Marchionini, 1995:5).

Although there are numerous programs to enable Internet users to explore the landscape, consensus exists that navigating the Internet is not a straightforward task (Thompson, Lewis, Brennan & Robinson, 2010; Voorbij, 1999:598). On the other hand, a skill that eludes average Internet users is obtaining relevant information on the Internet in a short amount of time (Chun, 1999:135). This is where search engines appear to be of great help. Many Internet users rely on search engines daily to find relevant data for a variety of purposes (Wallace, Kupperman & Krajcik, 2000:75). In a study conducted by George et al., (2006) it was confirmed that 97% of graduate students are utilising Internet searching. Furthermore, the study determined that nearly three-quarters (73%) list the Google search engine for their information seeking. Therefore, it is essential for the information professionals to study the information searching behaviour of academic communities.

Shortly after the birth of the Internet, Large, Tedd and Hartley (1999:5) mentioned that information seekers must not be treated as a homogenous group – they differ in

many ways, where their information retrieval experience level has a significant differentiating effect. Other authors state that there is a difference in the way that WWW searchers and traditional format searchers work when searching for information (Jansen & Pooch, 2001:244). In contrast to this finding, a similarity was found between the basic methodology of early online searching and modern Internet searching. Decades ago Lancaster (1978:72) listed a four-point sequence of steps to be followed for online retrieval: logging on, negotiating the search process, manipulating the results and logging off.

However, more recently Davis (2005:57) observed:

“The problem of student learning in the information age is not unique to Africa in general and South Africa in particular. In studies conducted elsewhere, it was found that students rely quite a lot on finding information on a computer, assuming that there’s nothing of value in the library.”

The easy-to-use WWW promotes more information seeking while constantly attracting new users, and achieves this considerably faster than traditional repositories. This seems to be what has catapulted the Internet to the top of the current information search resources list.

2.4 Database searching

Academic databases are large collected works which allow for the retrieval of data. They have a collection of information that is organised so that it can easily be accessed, managed and updated.

Reitz (2002) defines a database as follows:

“A database as a large updated file of digitized information related to a specific or field, consisting of records of uniform format organized for ease and speed of search and retrieval and managed with the aid of database management system software. This information lists bibliographic references, abstracts and full text documents, amongst others.”

Today, a database is still one of the largest contributors of information to researchers. More and more students are conducting their research on electronic databases; not only can a database be difficult to use and access, the information found on the database can have both useful and useless information co-existing (Uwimana,

Weideman & Richards, 2010). This claim is supported in a study of use and users of electronic library resources. Associated, Tenopir, Hitchcock and Pillow (2003) report several disadvantages with the use of online databases. These include the increase in usage as more resources become available, yet this makes it more difficult for the user to select an appropriate source. The aforementioned still leaves the researcher battling when separating relevant from irrelevant information (New Mexico State University Library, 2002).

Database searching generally has search functions, which appear to take the place of a full text search engine. Databases consist of searchable key fields, including titles, introductory text, authors, and subject terms. Although information on the Internet can be located using a search engine, most of the information contained in online databases might not be discovered. Nevertheless, Rumsey (2004:72-73) pointed out that the subscriber to online databases pay for:

- the well-ordered structure of the database;
- the ability to search in a structured fashion;
- the specialist content of the database; and
- the indexing and thesaurus construction.

One benefit of database searching is that, in many cases, there are additional live links and facilities on the database, which is not possible in a print version of the same publication (Rumsey, 2004:73). Even though the database is only as good as the information it is given, if the search query is not acceptable to the database it produces unsatisfactory or even no results.

Rumsey expressed that knowing about searching options of online database can help the users to use databases to their fullest capacity.

- Most databases are not case sensitive.
- Most databases require the use of structured searching, but some accept natural language queries.
- A properly constructed query enables the searcher to be highly specific about the information they wish to retrieve.
- Most databases offer a choice between quick and advanced search. Quick search can be useful when searching and using a narrow term. The advanced search option allows a more precise search.
- Searching using specified fields provides a great degree of flexibility and accuracy.
- Some databases offer an option to retrieve related references, which is a record on the same topic as that which has been retrieved.

Gash (2000) acknowledges that electronic databases are of central importance to anyone performing a literature search and that they cover a variety of subjects areas. This was confirmed by the longitudinal study conducted by Crawford, de Vicente and Clink (2004) on the use and awareness of electronic information services by students at Glasgow Caledonian University, where the study revealed that online databases were the main source consulted.

The findings revealed some of the disputes in using online databases, such as a decline to access databases remotely due to password requirements and licensing restrictions and difficulty in searching and navigation. Dewald (2005) views academics as playing a significant role in promoting such resources to students, yet a problem still exists when students are unaware of the availability of online databases.

2.5 Information seeking behaviour

According to Kakai, Ikoja-Odongo and Kigongo-Bukenya (2004), information seeking behaviour is an individual's methodology of sourcing information for personal use, knowledge updating, and development. Ernest, Level and Culbertson (2005:88) define information seeking behaviour as the complex patterns of actions and interactions that people engage in when seeking information for whatever purpose. However, Borgman, Smart, Millwood, Finley, Champeny, Gilliland and Leazer (2005:641) claim that information seeking behaviour is a broad sub-category of information use whereby it includes recognition from an individual of a knowledge gap that initiates the pursuit of information, and includes any behaviour an individual exhibits during the search process. Taylor and Procter (2005:1) emphasise that a human information seeker can scan literature efficiently using manual or automated methods to identify a set of useful articles and books. However, Aina (2004:67) then suggests that information seeking behaviour depends on a user's education, access to the library and the length of time a user wishes to devote to the information seeking process. This is all due to the complex nature of the process.

Other authors define information seeking behaviour as the study of the way in which people need, seek, give and use information in different contexts, including the workplace and everyday living (Pettigrew, Fidel & Bruce, 2001). However, in the context of this study, information behaviour will be used as it applies to postgraduate students as they seek and use information to support their academic research process.

Wilson's general model of information seeking behaviour is presented in Figure 2.1 (Wilson, 2000) where it is attempted to describe the process a user follows to satisfy an information need. It pictures the cycle of information activities, from the rise of the information need to the phase when information is being used. It includes various intervening variables, which have a significant influence on information behaviour, and mechanisms which activate it.

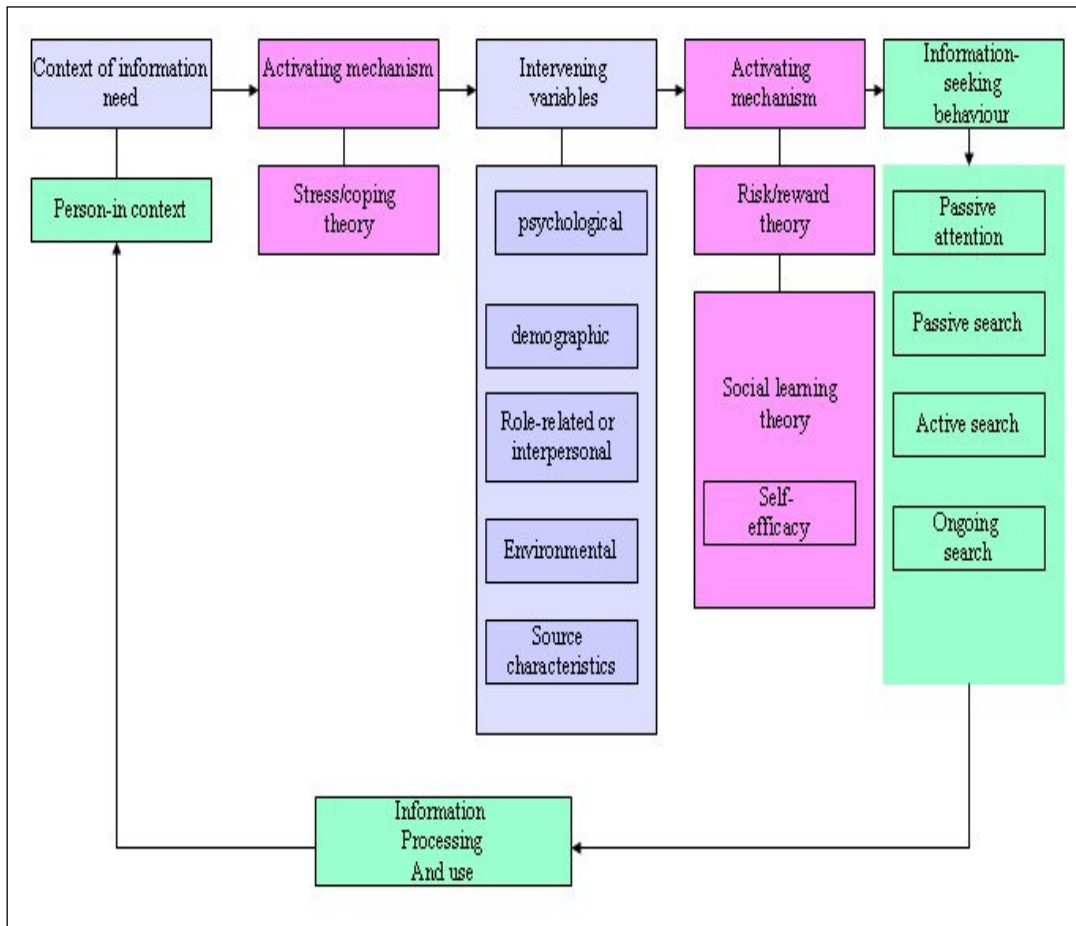


Figure 2. 1: Wilson's general model of information seeking behaviour

(Source: Wilson, 2000:53)

Information seeking behaviour is the purposive seeking for information as a consequence of a need to satisfy some goal. In the course of seeking:

- the individual may interact with manual information systems (such as a newspaper or a library); or
- with computer-based systems (such as the WWW) (Wilson, 2000:49).

Although the information seeking behaviour entails action taken by a user to carry out an information need, Nkomo (2009:32) mentioned that it can also be affected by the characteristics of the users, such as age, knowledge and expertise.

The information search process describes common experiences in the process of information seeking for a multifaceted task that has a discrete beginning and ending and that requires considerable construction and learning to be accomplished (Kuhlthau, 2004). The model of the Information Search Process (Figure 2.2) is expressed in a holistic view of information seeking from the user's perspective in six stages.

- Initiation - be aware of a lack of knowledge or understanding and feelings of uncertainty and apprehension.
- Selection - general topic or problem is identified and initial uncertainty often gives way to a brief sense of optimism and a readiness to begin the search.
- Exploration - incompatible information is encountered and uncertainty, confusion, and doubt frequently increase.
- Formulation - focused perspective is formed and uncertainty diminishes as confidence starts to increase.
- Collection - information pertinent to the focused perspective is gathered and uncertainty diminishes as confidence begins to increase.
- Presentation - the search is completed, enabling the explanation to other users or in some way put the learning to use.

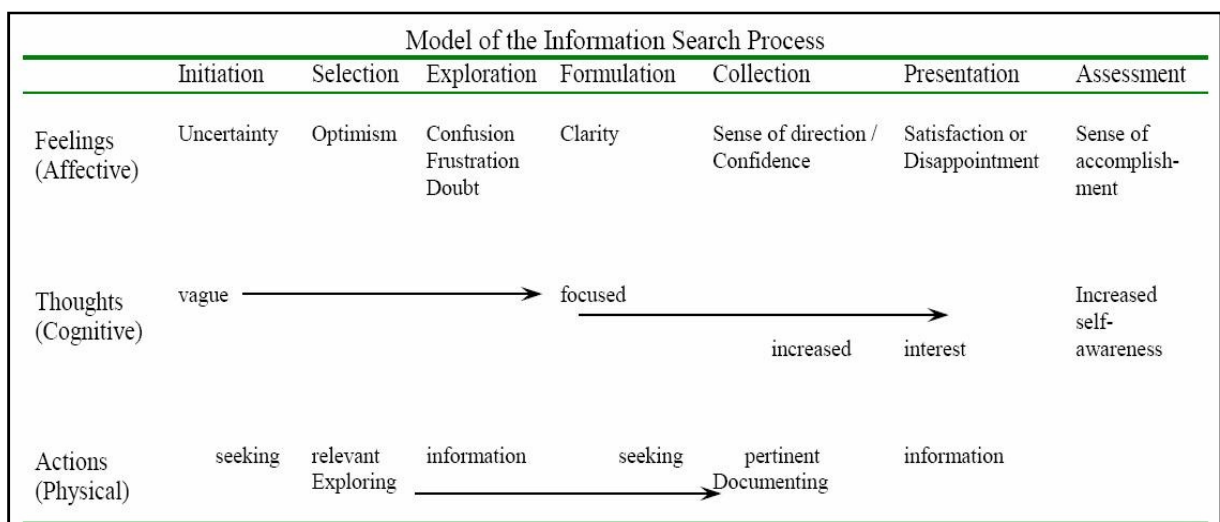


Figure 2. 2: Model of the Information Search Process

(Source: Kuhlthau, 2004:82)

2.5.1 Search behaviour with free-form searching

Search engines have garnered not only commercial but also academic attention (Bridwell, 2011). Numerous studies have been undertaken to analyse the behaviour of search engine users. Wilson (2000:49) referred to information searching behaviour as defined at the micro-level of behaviour employed by the searcher in interacting with information systems of all types. It consists of all the interactions with the system:

- at the level of human computer interaction (for example, use of the mouse and clicks on links); and
- at the intellectual level (for example, determining the criteria for deciding which of two books selected from adjacent places on a library shelf is most useful), which will involve mental acts, such as judging the relevance of data or information retrieved.

However, information searching behaviour highlights how a user interfaces with a specific information retrieval system to search for relevant information. In the context of this study, information searching behaviour will be used to measure the number of search queries, the number of words in a query, and the number of thesaurus terms used in query formulation.

A study was conducted by Stacey and Nixon (2003) titled “Getting better search results: a question of query formulation”. These authors identify the advantages and disadvantages of primary approaches for locating information on the Web using the URL, directories, and search engines. It was found that the lack of searching skills resulted in conceptual errors, overly-broad search queries, low usage of Boolean operators and quotation marks, and use of irrelevant words. Weideman’s (2010) research on academic search query generation proves that keyword linkage is more efficient than phrase searching or surname joining.

Ford, Eaglestone, Madden and Whittle (2009) investigated the impact of several human individual differences on the WWW searching of a sample of the public. They found that the 91 participants performing 195 control searches appear to have had several individual differences in the use of various search strategies, and had trouble at various levels of perceived control search.

In another development, a study was carried out on session characteristics based on three Web search environments: an academic website, a public search engine, and consumer health information portal. It was determined that three behavioural elements which are common to the three environments were “hit and run” sessions on focus topics, short sessions on popular topics, and longer sessions with the use of

obscure terms and greater query modification (Wolfram, Wang & Zhang 2009). These authors conclude that a better understanding of session characteristics is needed to enable system designers to develop more responsive systems that can accommodate advanced search features to deal with complex search behaviours.

The research of Davis (2007:1) adopted the method that uses online transaction logging to view precisely how students are searching online databases in real time. It shows that students could not formulate search queries properly. Davis concludes with a suggestions framework for collaboration in acquiring technologies which are conducive to student growth and development.

2.6 Searching success rate

Searching success rate can be defined as the number of successful Internet searching sessions as a percentage of total number of Internet searching sessions. The accessing of global information via search engines and discovery tools has changed; this approach is in line with Whitfield's (2008) studies. Whitfield indicates that, since the mid-1990s, and later the early 2000s, the use of electronic resources has transformed information gathering for academic research, and this development has influenced academic programmes and subjects in varying degrees. Where previously acquiring information in all subjects was based on library usage, researchers in many subjects no longer physically visit libraries, as they have convenient access to vast amounts of information from various devices including personal computers, laptops and mobile handsets.

While certain authors like De Jager (1995) and Edling (2000) claimed a decade ago that students should know how to retrieve information from electronic sources, others argue that users now face the daunting task of determining which sources are valid and which are not (Wagner, Cheung, Rachael & Böttcher, 2006). This shows that the more sophisticated the Internet technology the more complex it becomes to use it. Yet, certain authors claim that in general, obtaining relevant information in an information source is not a difficult task as they believe even the novice information searcher can extract relevant documents in rank order of calculated relevance (Ross & Wolfram, 2000). Zhu, Chen, Chen and Chern's (2011) study argue that the positive effect of Internet information seeking to students' academic performance is mediated through academic self-efficacy. This argument appears to be relative, since Bruce (1999) states that most Australian academics have a high expectation of success as they engage in information seeking on the Internet, which might not be the case elsewhere. What appears clear is that a large body of evidence points to the fact that

most Internet searchers find it difficult to locate and retrieve relevant data on the Internet (Aula, Khan & Guan, 2010; Hassan, Jones & Klinker, 2010; Weideman & Strümpfer, 2004). Further, according to Wisniewski (2010), it is critical to the user that the search returns relevant results.

In summary, Weideman (2009:10) identified the following searching strategies sequence of steps during empirical experiments with learners in South Africa and Germany as producing a consistently high success rate in Internet searching:

- Express the information need as a single, keyword-rich English sentence.
- Remove all stop words from this sentence.
- Type the remaining string of keywords into a search engine search box.
- Using multiple simultaneous windows, open between one and ten windows of potential relevant answers.
- Filter these until one or more useful websites remain – the need has been met.

Although Internet searching is a complicated cognitive skill, a study done by Palmquist and Kim (2000) emphasized that students' practical experiences on Internet searching play a more important role in searching outcomes than general experiences on using computer and the Internet. Therefore, in order to search successfully using free-form searching, users need to consider the usages of their searching strategies to generate better outcomes (Tu, Shih and Tsai, 2007).

2.6.1 Complexity of search engine information retrieval

Information retrieval is finding material of an unstructured nature that satisfies an information need from within large collections stored on computers (Manning, Raghavan & Schütze, 2008). The term "retrieval" refers to the extraction of information from a content collection. A few of the challenges that users face when they are searching for information, as identified by Lallimo, Lakkala & Paavola (2004:4) are technical illiteracy and/or information illiteracy (mostly browser related navigation in the hypertext jungle), poorly developed search strategies, misinterpretation of information and the poor utilisation of information.

Cutrell and Guan (2007:1) claimed that:

"An increasingly large fraction of human knowledge migrates to the WWW and other information systems finding useful information is simultaneously more important and much more difficult".

Furthermore, Web search engines can search through a vast amount of information at a remarkable speed, yet, there is still a limitation on the quality of the results due to different motives, such as time retrieval of duplicate records and failure to retrieve relevant information that convert in retrieving large amounts of irrelevant information (Visser, 2006:32; Oppenheim, Morris & McKnight, 2000:190-191; Kritzing, 2006:14).

However, the Web is a dynamic, uncooperative environment with several issues that make analysis of a Web search very difficult (Beitzel, Jensen, Chowdhury, Frieder & Grossman, 2007). These include the fact that typical Web search engine traffic consists of many hundreds of millions of queries per day (Sullivan, 2003) and is highly diverse and heterogeneous (Eastman & Jansen, 2003) requiring a large sample of queries to adequately represent a population of even one day's queries.

2.6.2 Search services

Search engines are essential for obtaining information on the WWW and the emergence of the search engine makes it possible to swiftly extract the information that the user requires from the massive ocean of information on the Internet (Jian, Wu, Zhan & Xu, 2011). More than a decade ago, Spink and Xu (2000) pointed out that search engines have become the primary searching tool used for information retrieval on the Internet. However, there are millions of Internet users and about 85% of them utilise search engines to locate information on the Internet (Kobayashi & Takeda, 2000). Figure 2.3 portrays the relationship between search engines and users. Usability can be defined as the ease with which a tool can be used to achieve a given goal (Wikipedia, 2011; Weideman, 2009). Furthermore, the search engine spends most of its time and energy providing for the information needs of the user. According to Weideman, the search engine is a company which maintains programs that supply users with free answers to their information needs.

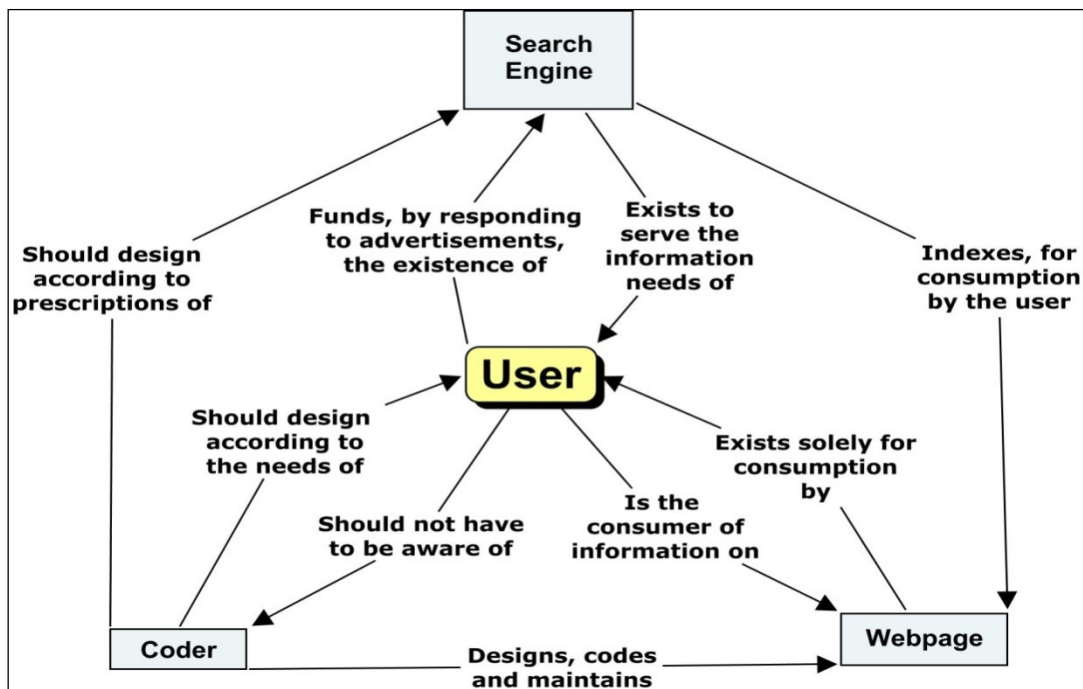


Figure 2. 3: The relationship between coder, Webpage, user and search engine

(Source: Weideman, 2009:4)

Today, search engines are classified into two different types; crawler-based or spider-based, and directories. The first type is known as search engines and the human-based are known as Web directories (Green, 2000:125; Thurow, 2003:11; Chambers, 2005:26). Table 2.3 lists the basic differences between Web directories and search engines.

Web directory	Search engine
Edited by a human reviewer	Crawled by a robot spider
Meta tags are not considered	Meta and title tags considered
HTML code not very important	HTML code extremely important
Most allow paid submission	Few allow paid submission
Quality of site very important	Quality of site not very important

Table 2. 3: Differences between Web directories and search engines

(Source: Anon, 2001; Mbikiwa, 2005:21)

To implement any Web search strategy, there is a need for the use of one or more Web search tool. According to Schneider and Evans (2007:158) there are four broad categories of Web search tools including search engines, directories, meta-search engines, and other Web resources.

2.6.2.1 Web Search Engines

Web search engines are an essential tool for finding Web based information and have developed into widely used services (Martzoukou, 2008:182). A Web search engine is a web site that finds other webpages that match a word or phrase users enter. Weideman (2009) defines a search engine as a Web site that collects and organizes content from all over the Internet; those wishing to locate something would enter a query about what they do like to find and the search engine provides links to content that matches the user's requirements.

According to Weideman (2009:22), a search engine has four components; Weideman goes further and identifies those components of the search engine and how they operate.

- An interface - the interface mediates the interaction between user and webpage.
- An algorithm - it decides on rankings of websites by using a program on the search engines.
- An index - it is a large set of files which contain all the data collected about webpage storage.
- A harvesting mechanism - often called a crawler, it is a computer program which traverses the Internet continuously gathering information about websites in the progress.

The basic search engine page for Google, one of the most popular search engines, appears in Figure 2.4. A basic search engine page includes a text box for entering a search expression and a command button to begin the search.



Figure 2. 4: Google basic search page

(Source: <http://www.google.co.za>)

For assessing the performance of search engines there are various measures, such as database coverage, query response time, user effort, and retrieval effectiveness. The dynamic nature of the Internet also brings additional performance measure concerns regarding index freshness and the availability of the Internet pages as time passes (Bar-Ilan, 2002). The study discussed by Gordon and Pathak (1999) more than a decade ago measures the performance of eight search engines using 33 information needs. The query preparation was done iteratively to achieve the best performance of individual search engines, although each individual search query used the same information need in a different way. The findings of the study indicate that retrieval effectiveness is low and there are statistical differences in the retrieval effectiveness of search engines. What appears clear is that the process of measuring retrieval effectiveness requires user queries. Yet, it has been claimed that it is not easy for users to formulate effective queries to search engines. One of the reasons for the aforesaid is the ambiguities that arise in many terms of a language. Queries having ambiguous terms may retrieve the documents for which users are searching. Schneider and Evans (2007:158) suggest that prior to users commencing with any Web search, they should decide whether the question is specific or exploratory. Thereafter users can begin the actual Web search process which includes four steps. The first step is to formulate and state the question. Next, select the appropriate Web search tool. After obtaining the results, the third step is to evaluate the search results to determine if they answer the question and finally, if the results are not satisfactory, select a different search tool and report the process.

2.6.2.2 Meta-search engines

Rather than searching the Web, meta-search engines add value by collecting results from several search engines. The results are then compiled into the meta-search engine. Lu, Meng, Shu, Yu and Liu (2005) defined meta-search engines as systems that provide unified access to multiple existing search engines. However, after the results returned from all used component search engines are collected, the meta-search system merges the results into a single ranked list. In other words, meta-search engines combine the results of several basic search engines without having a database of their own. According to Joachims (2002) such a setup has several advantages. Firstly, it is easy to implement while covering a large document collection found on the WWW. Secondly, the basic search engines provide a basis for comparison. Furthermore, users conducting exhaustive searches on obscure topics save time and effort when using a meta-search engine (Hubbard, 2006). However, a study done by Green (2000:127) found that several meta-search engines tend to duplicate results, and this frustrates users. Another study performed by Zhang and

Cheung (2003:434) established that meta-search engines are able to remove duplicates, however, whilst meta-search engines have this ability, duplicates are nonetheless found in their results (Xie, 2004:216).

Mamma.com was one of the first meta-search engines on the Web. It forwards search queries to a number of major search engines and Web directories, including About.com, Google, Open Directory, and others (Schneider & Evans, 2007:173). Figure 2.5 shows the Mamma.com meta-search engine homepage.



Figure 2. 5: Mamma.com meta-search engine homepage

(Source: <http://www.mamma.com>)

2.6.2.3 Directories

According to Stamou, Krikos, Kokosis, Ntoulas and Christodoulakis (2005) a directory provides a way of locating relevant information on the Web. Typically, it is a set of webpages organised in a hierarchical structure whereby each webpage in the structure provides access to more specialized topics and it lists links to sites which provides information on the current topic. Although a directory does not store information internally, it provides references to information elsewhere on the Internet. The difference between a search engine and a Web directory, revealed by Schneider and Evans (2007:166), is that the Webpages included in a Web directory are selected

and organized into categories prior to users accessing the directory. In a search engine, the database is searched in response to a user query, and results pages are created in response to each specific search. In contrast, there is the risk that the searcher can end up navigating through such a directory without getting any closer to the topic they require. However, directories are useful when the searcher wants a selection of sites about a topic (Rumsey, 2004:161). Green (2000:125) explains that Web directories have four attributes:

- They contain a pre-defined list of websites.
- They are compiled by human editors.
- They are categorized according to subject or topic.
- Human editors select certain content.

One of the oldest directories on the Web is Yahoo!. Although Yahoo! does use a few automated programs for checking and classifying its entries, it relies on human experts to do most of the selection and classification work (Schneider & Evans, 2007:167). The Yahoo! Web directory homepage appears in Figure 2.6.

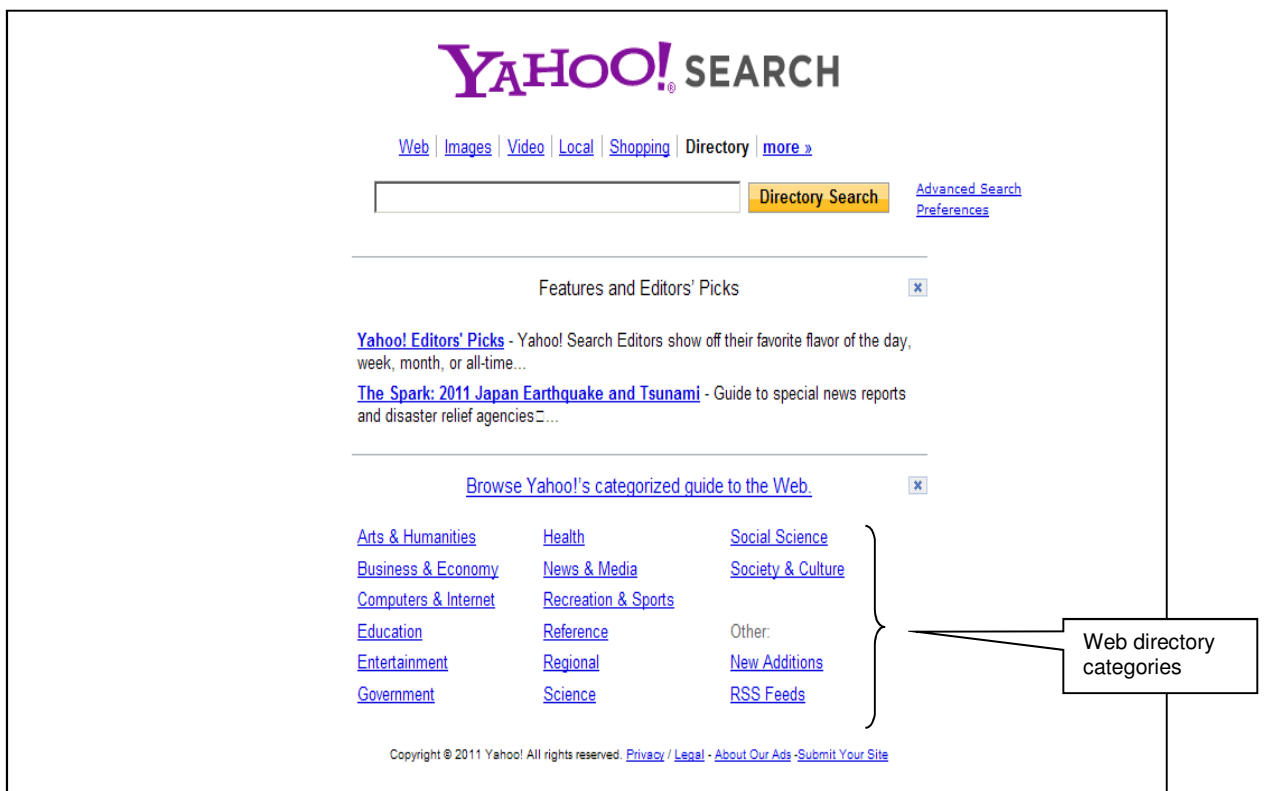


Figure 2. 6: Yahoo! Web directory homepage

(Source: <http://www.yahoo.com>)

2.6.2.4 Social Networking

The popularity and growth of social networking Internet websites have been phenomenal, especially amongst the younger generations. The 21st century continues to lead in technological advances that change the nature of communication, socialization and private versus public information (Cain, 2008). Social networking is one of the aforementioned. Social networking is an interaction between a group of people who share a common interest using social contacts to network by using Internet network groups such as Facebook and Twitter to network and communicate. Social networking software has been defined by Ellison, Steinfeld and Lampe (2006) as online spaces that allow individuals to present themselves, articulate their social networks and establish or maintain connections with others. According to Kaplan and Haenelein (2010) social networking sites are applications that enable users to connect by creating personal information profiles, inviting friends and colleagues to have access to those profiles, and sending emails and instant messages between each other. Facebook, Twitter and MySpace are the dominant global social networking sites (Abel, 2011). For example, Twitter users tweet about any topic within the 140-character limit and follow others to receive their tweets. Twitter is “a new powerful medium of information sharing, for both individuals and organizations” (Kwak, Changhyun, Hosung & Moon, 2010). Facebook and other online social networking sites require users to register themselves online and create a personal profile, and the only requirement to join a social network is a valid email address. One of the significant benefits of Facebook is that it helps students to connect and stay in contact with old and new friends and assists students in developing their identities and finding their fit within a university community (Cain, 2008). However, researchers have long recognised the potential of online communication technologies for improving network research (Rogers, 1987; Watts, 2007).

2.7 Postgraduate students

The first degree a student enrolls for at a university is an undergraduate degree, for example, a Bachelor of Technology or Bachelor of Commerce. Certificates and diplomas are also undergraduate qualifications. An undergraduate student is one who is studying for his/her first degree, certificate or diploma. A graduate is an individual who has met the requirements of a degree and has been awarded with one. Only students who have already completed an undergraduate degree can register for a postgraduate course.

Postgraduate qualifications involve more advanced study, often in the first (undergraduate) degree. These qualifications include honours and masters degrees,

postgraduate certificates and diplomas and doctorates. Graduate qualifications sometimes involve study in a field other than that of the first degree. A postgraduate qualification allows the changing of subject areas and some prepare for employment in a certain field such as journalism or information technology.

According to the Council on Higher Education (CHE) in South Africa, the yield of university graduates and especially postgraduate students is an essential component of the national system of innovation of modern and industrialised societies (Council on Higher Education and higher Education Quality Committee, 2008). The CHE emphasises that although such graduates have acquired the necessary knowledge and skills that underpin the modern knowledge economy and are able to produce new knowledge, there is still a skills shortage in the country. This is can be attributed to the lack of sufficient postgraduate level degree holders, and initiatives for their training as indicated by the CHE. Some of these initiatives are provided by the Department of Science and Technology and the National Research Foundation to accelerate the successful production of doctorates through the system.

2.7.1 Postgraduate Research

It has been argued that many students confuse the notion of postgraduate research with “invention” and “discovery” (Toncich, 2006). Postgraduate research represents an apprenticeship in the field of research. Toncich (2006) explains that the objective of postgraduate research is not necessarily to make a breakthrough invention or a major scientific discovery; it is, rather, a mechanism by which graduate students learn how to undertake a systematic investigation. However, in South Africa, a considerable number of students are poorly prepared for higher education (HE); they are unable to cope with HE demands and, consequently, one in every six students never graduate (Nair & Pillay, 2004). Various factors contribute to the low success rate of postgraduate students in South Africa. Some of these include: unpreparedness for the demands of HE, insufficient study skills, emotional unpreparedness, inadequate personal support, low or no motivation, technophobia and computer literacy, and competency that is lacking (Castles, 2004).

Furthermore, (Jancey & Sharyn, 2013) quoted that the diversity of the postgraduate student population in terms of age, cultural background, technological expertise and time since their last enrolment at a tertiary institution poses challenges for university academics. In addition Carroll, Ng & Birch (2009) and Jancey & Sharyn (2013) have highlighted reasons for postgraduate student non-completion of courses: situational circumstances within a student’s life; dispositional beliefs, values and attitudes that

may prevent a student's participation; and institutional challenges that arise from policies, procedures and structures of the university itself.

2.7.2 Challenges of postgraduate research

Research can generally be subdivided into basic, applied/action, collaborative, contract and/or sponsored research (Postgraduate Research, 2009). The research quality of a university is measured by the excellence of its library facilities described by Mutula (2009), as well as the following:

- quality of Information and Communication Technology (ICT) infrastructure;
- supportive institutional framework;
- diversity and strength of postgraduate programmes;
- level of research funding;
- links with the international scholarly community and industry;
- integration and use of ICT in teaching and research;
- availability of digitised local content;
- functional institutional repository;
- international students and faculty members; and
- the quantity of collaborative and multidisciplinary research, among other characteristics.

Postgraduate education in general, and postgraduate research in particular, faces challenges of demand, supply, quality and returns on investment with respect to both providers and clientele (Kearney, 2008). However, developed countries such as Germany, Australia, Canada, the United States and New Zealand have made some progress in trying to address them (Scholtz, 2007). Research in most universities in Africa is poorly co-ordinated; it takes on average 6-8 years to complete a PhD in most African universities due to inadequate resources and bureaucracy in the approval process, which involves departments, faculties and universities (Manyika & Szanton, 2001). This resulted in low research outputs and generally discouraged students.

Botha and Simelane (2007) observe that in most South African universities, research is either not published or not digitised, making it largely inaccessible. The University of Stellenbosch's 2007 Annual Report mentions that the university faces challenges relating to student access and success, backlog with regard to facilities, equipment and other resource capital, and decreasing government subsidies, thereby impelling universities towards far reaching structural changes.

The Department of Higher Education and Training stated that from January 2010 there were a further 78 registered and 22 provisionally registered private HE institutions. However, the Province of the Western Cape includes four public institutions of tertiary education. One of these institutions is a university of technology, namely Cape Peninsula University of Technology (CPUT), focusing mainly on vocational and professional studies. The University of the Western Cape (UWC), University of Cape Town (UCT) and the University of Stellenbosch (US) are all examples of standard universities.

For this research the focus is on CPUT students as indicated earlier. CPUT was established on 1 January 2005 when the Cape Technikon and Peninsula Technikon merged. This was part of a national process of transforming the higher education landscape in South Africa (Cape Higher Education Consortium, n.d). CPUT is the largest university in the province with more than 32 000 students. Presently the University offers full-fledged programs in Engineering, Business, Informatics and Design, Applied Sciences, Education and Social Sciences, and Health and Wellness Sciences (Cape Peninsula University of Technology, n.d).

Although African universities are known to suffer from various constraints that affect the quality of research and learning, the ranking of universities has ruffled some egos, especially due to the impact such ranking could have on resource allocation and attracting students and staff in a globalised competitive environment (Institute of Higher Education, 2010). Sawyer (2006) observes that research capacity development in most African countries represents an instance of market failure because explicit public policy does not exist to reinforce and ensure that higher education and research receives adequate investment from both private and public sectors for infrastructure development in the form of laboratories, equipment, libraries, and a system of information storage, retrieval, and utilisation.

2.8 Chapter summary

This chapter has discussed the background information on the success rate of searching and retrieving information on the Web when using free-form for academic information searching. Literature was reviewed on an overview of the Internet and it emphasized how the Internet and WWW are positioned as the main sources of information for researchers even though this ever-growing information source has made it difficult to ascertain the quality and authenticity of such information.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter outlines the research methodology and identifies the tools and techniques employed in a systematic data collection that was used.

3.1.1 Pilot study

In previous similar studies, a pilot study provided a researcher with ideas, approaches, and clues that may not have been foreseen prior to conducting the pilot study. Such ideas and clues increase the chances of obtaining clearer findings in the main study.

Prior to this main study, a pilot study was therefore conducted by providing online questionnaires to determine: the frequency of search engine usage by CPUT postgraduate students, the amount of time postgraduate students spend to search for one academic reference, and the success rate when searching for academic information.

This pilot study was conducted on a small group of students - twelve CPUT postgraduate students were involved. Students completed an online survey. Through the questionnaire information was gathered about participants' levels of searching expertise, search frequency, the search engine used; the amount of time postgraduate students spend to search for one academic reference; result page reading and success rate. The results of the pilot study are listed below.

3.1.1.1 Level

Twelve postgraduate students responded to the questionnaire - 83.3% were masters and 16.7% were doctoral students.

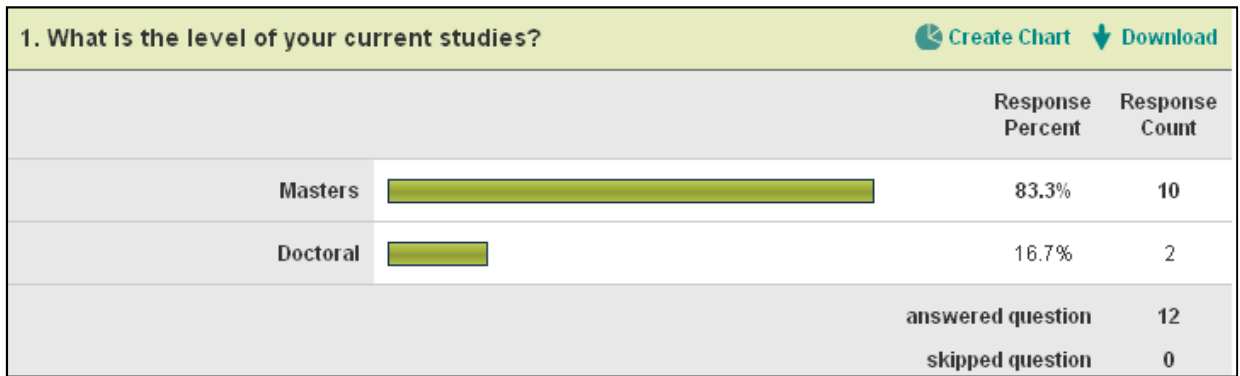


Figure 3. 1: Level of participants

3.1.1.2 Search frequency

The second question was set to determine the frequency of search engine usage. Results show that 66.7% of respondents search more than once per day, 8.3% once per day, 16.7% a few times per week and 8.3% once per week.

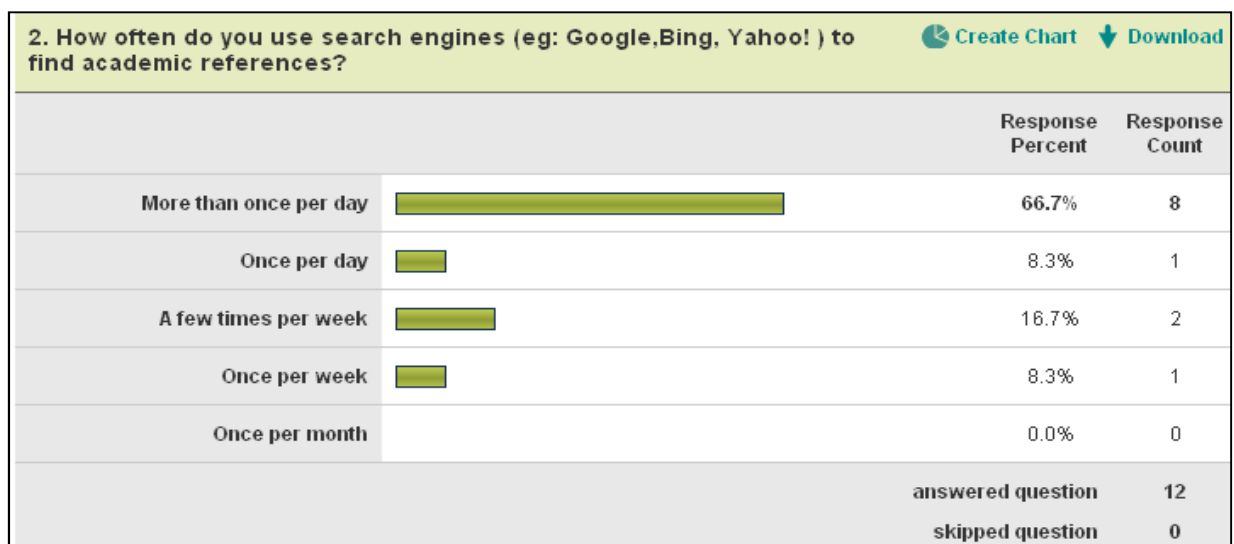


Figure 3. 2: Search engines used

3.1.1.3 Time spent

Question three was set to determine the amount of time postgraduate students spend to search for one academic reference. Results are that 16.7% spend up to a few minutes, 58.3% spend about half an hour and 25.0% spend about one hour.

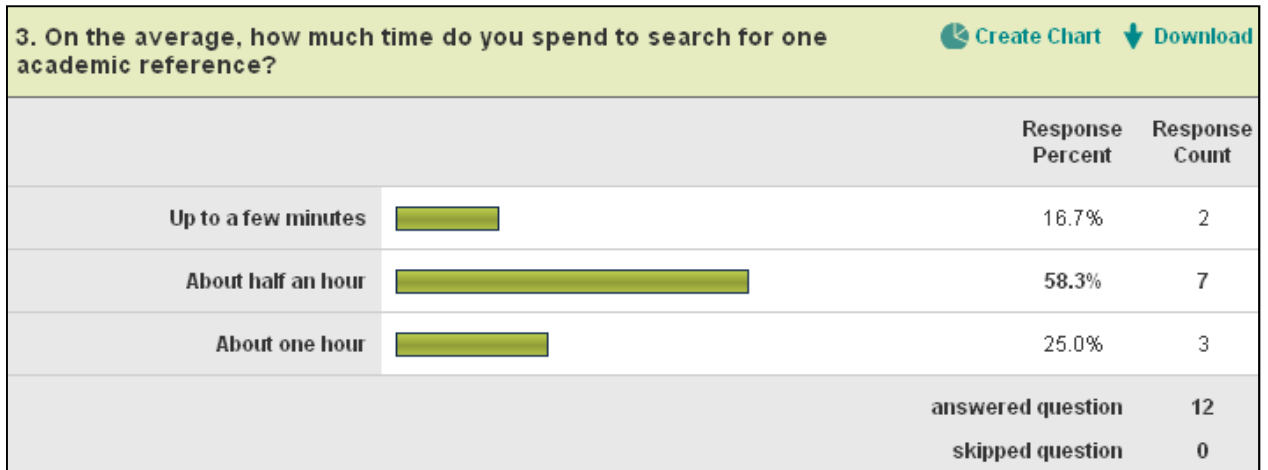


Figure 3. 3: Time spend to search for academic reference

3.1.1.4 Result page reading

When postgraduate students do not find what they are looking for, how far do they read results on a search engine page? It was found that 16.7% stopped their search on the first page, 25.0% would search the first and second pages while 58.3% the first, second and third pages.

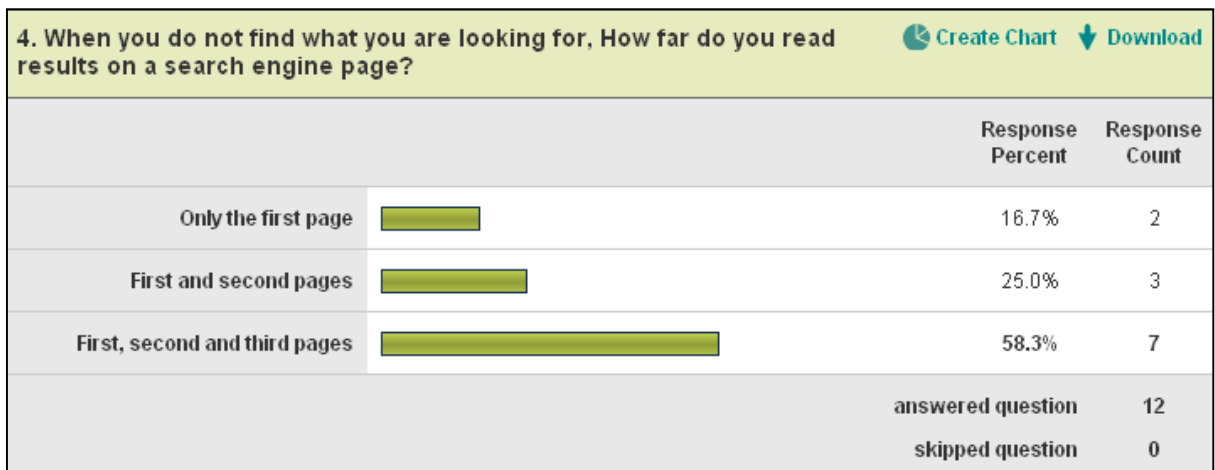


Figure 3. 4: Result page reading

3.1.1.5 Success rate

The respondents were asked to record their success rate. They simply had to state whether or not they have found the exact information they required in the time allocated. The researcher then calculated the average success rate as follows:

$$\text{Success Rate} = (\text{Number of successful searches}) / (\text{Total number of searches}) \times 100.$$

Most postgraduate students (58.3%) found the information they were looking for between 50% and 79% of the time.

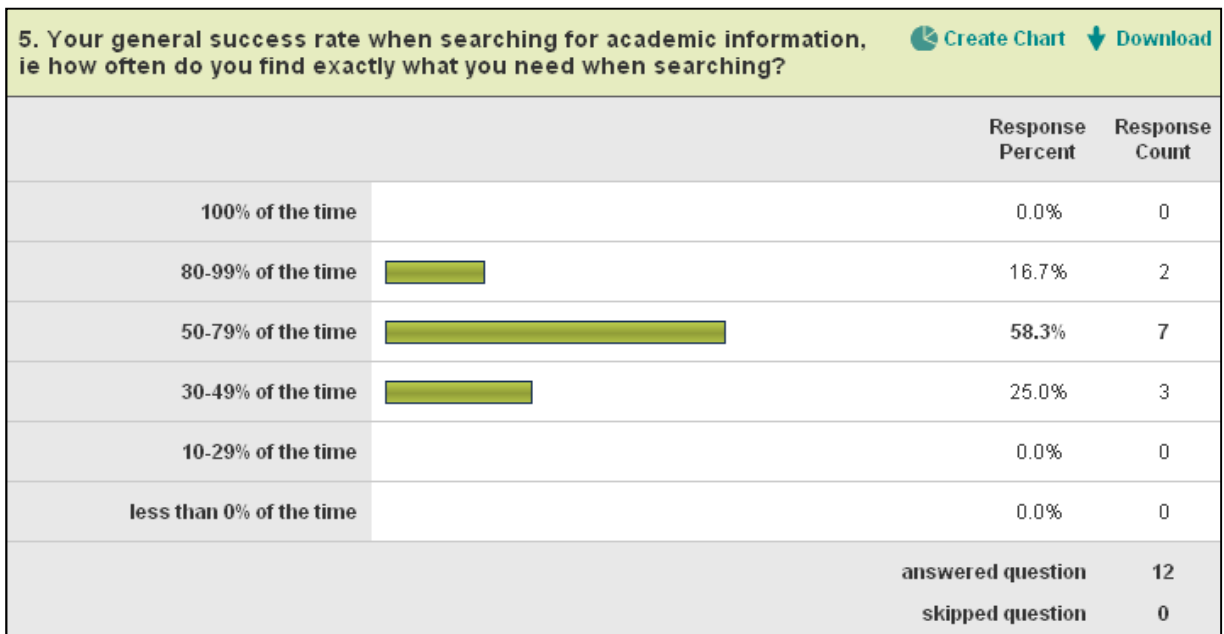


Figure 3. 5: Success rate

Summary: the majority of respondents (66.7%) search more than once per day, 58.3% of respondents spent about half an hour searching for one academic reference and when they do not find what they are looking for the majority of respondents (58.3%) would read the second and third result pages. However, the majority of postgraduate students (58.3%) found the information they were looking for and their success rate ranged from 50% to 79%. However, this success rate was not considered to be adequate, hence the motivation for this study.

3.2 Research questions

This research is based on the following research question:

What is the success rate of postgraduate students with free-form Internet information searching?

To answer the above research question, the following research sub-questions were identified:

- *What are the challenges being faced by free-form searchers?*
- *Which search engines are used by postgraduate students, how is the search done (the query length) and what is the quality of their results?*

3.3 Research design

Research design is the strategy for a study and the plan by which the strategy is carried out (Cooper & Schindler, 2003:170). The research design brings all the elements of the research study together.

Furthermore, to achieve the best results for the research objectives and to answer various questions which constitute this research, the researcher chose the method that would allow effective evaluation of data collected.

Leedy and Ormrod (2005:132) identified two main research methodologies, namely qualitative and quantitative which will be discussed below:

3.3.1 Qualitative research

Qualitative research aims to acquire an in-depth understanding of a phenomenon using words. It is informative and can be conducted on a smaller but focused sample using data collection methods such as observations, interviews, focus groups and open-ended questionnaires. The qualitative approach, according to Shenton and Dixon (2003:1), expressed that one can explore a particular phenomenon at length, typically through the collection and analysis of subjective data from a relatively small number of participants involved in the processes, circumstances or situations at the heart of the enquiry. Leedy and Ormrod (2005:94-97) identify five characteristics of the qualitative approach:

- The *purpose* of qualitative research is to describe and understand a complex phenomenon, frequently explanatory in nature by means of observation.
- The *process* of qualitative research is initially holistic and becomes more focused as the research progresses.
- *Data collection* of the qualitative research tends to collect data from a small number of participants, and then the study is done in depth with the objective to understand the phenomenon.
- *Data analysis* of the qualitative research is done subjectively, whereby the data is searched for patterns.
- *Reporting findings* of the qualitative research is done when qualitative researchers generate their interpreted conclusion from the data collected.

One of the disadvantages of qualitative research is that its results are unable to support empirical judgements; however it can be employed to draw analytical conclusions (Maxwell, 1996). The objective of qualitative research is to collect data and information and gain a better understanding of the research topic. The other

authors stated that the distinction between qualitative and quantitative research is that qualitative research usually aims for depth of understanding instead of quantity of understanding, as is the case with quantitative research (Henning, Van Rensburg & Smit, 2004:3).

This approach was not selected for this research because the researcher wanted a large sample from which to collect data and being able to draw statistical inferences. Moreover, Johnson and Onwuegbuzie (2004) emphasize how it can be difficult for a single researcher to carry out both qualitative and quantitative research, especially if two or more approaches are expected to be used concurrently as it may require a research team.

3.3.2 Quantitative research

This study is a quantitative method since as it employed a quantitative case study approach in which the questionnaire was the main data collection instrument. Quantitative research signifies the use of numbers to explain and predict a phenomenon. With a quantitative method, data can be collected using standard instruments that include closed ended questionnaires and experiments. According to McCarthy (2006), quantitative methods are perfect for getting to the nuts-and-bolts of a situation, or the what, where and when questions. Quantitative research has the advantage of being able to draw statistical inferences, which enables the researcher to draw empirical conclusions about a population based on a sample (Maxwell, 1996). Quantitative methods focus attention on measurements and amounts more and less, larger and smaller, often and seldom, similar and different, of the characteristics displayed by the people and events that the researcher studies (Thomas, 2003). Leedy and Ormrod (2005:95-97) identify five characteristics of the quantitative approach:

- The *purpose* of quantitative research is to test the hypothesis and to search for clarification to create generalisations that would contribute to the theory.
- The *process* needs to be structured as concepts, variables and measuring methods need to be defined beforehand and remain the same throughout the research.
- During the *data collection* process, one or more variables in the hypothesis need to be identified for studying. Data must be collected relating only to those variables. Even though data is collected from a population sample, the data must be converted to numeric which in turn will represent that population.
- *Reporting finding* in quantitative research occurs whereby researchers make use of predetermined summarised statistics.

- *Data analysis* takes place with logical reasoning in mind. A logical conclusion from the analysis to predetermined statistical procedure must be the objective to the researcher.

However, quantitative research can be distinguished from qualitative research because of its features (Fox & Bayat, 2010:77-78):

- Data is in the form of numbers.
- The focus is concise and narrow.
- Data is collected by means of structured instruments such as questionnaires.
- Results are based on larger sample sizes representative of the population.
- Analysis of results is more objective.
- Concepts are in the form of distinct variables.
- Standardised measures are systematically created before data collection.
- Reasoning is logically deductive, going from the general to the specific.
- Knowledge is based on the relationship between cause and effect.
- Analysis progresses by way of charts, statistics and tables.

This research method was utilized for this research as it is representative and can be conducted on a large sample.

Furthermore, the researcher makes use of the quantitative approach as it made it easier to measure descriptive aspects of the study, such as the composition of the population, and it was incorporated in the structured questions included in the survey.

3.3.3 Case study

The research undertaken focuses on the use of free-form information searching by CPUT postgraduate students and their success of searching on the Web. This research is supported by theories of Internet search engines. Therefore the complexities of Internet search engines usage are taken into consideration. Given this background, the case study method is seen to be the most suitable for this study. Although there is no single or clear definition of case study research in the existing methodology literature, Stake (2005) highlighted the point that a case study represents both the method of investigating the case (object of the study) and the outcome of the investigation.

3.3.4 Triangulation

Olsen (2004) defined triangulation in research as the collaboration of data or methods portraying different viewpoints or standpoints which can shed light on a topic. Leedy and Ormord (2010) further state that the numerous sources of data are gathered with the expectation that they will all merge to support various perspectives, hypotheses or theories. The researcher selected triangulation as it would guide the researcher's results, interpretation and allow the researcher to gain an increased reliability from the sources of the questionnaires. This approach of triangulation complemented the data, as new results and quantitative data was collected to answer the research question.

3.4 Data collection tools

In carrying out this research study, the conceptual framework in Figure 1.1 was used as the basis of the study –searching success rate in free-form search. As explained in Chapter 2, the concepts and the process of free-form Internet searching success rate (as found in the literature) is based on the use of Internet search engines to retrieve information on the Web. Moreover, understanding the entry mode is the key to resolving and understanding information retrieval systems and judging the relevance of information retrieved. With this in mind, the explanation of the research design now leads with data collection processes.

As it is well known that the most commonly used data collection tools in a survey consist of self-administered surveys or questionnaires, personal interviews, and/or focus groups, and as already noted, this study employed questionnaires.

3.4.1 Questionnaires

The data collection instrument that was utilised in this study is the questionnaire. Welman and Kruger (2005) describe a questionnaire as a data gathering form with a set of questions designed to generate the data necessary for accomplishing the objectives of the research project. The researcher chose questionnaires as the main data collection instrument for the following reasons:

- Questionnaires permit respondents, especially students, time to consider their responses carefully, without interference from the interviewer.
- Since the researcher has produced a uniform set of questions, it was possible to design questionnaires with closed questions, for responses to be standardised for ease of interpreting.
- It was relatively easy to obtain an overall measure of the results.

- Questionnaires generally permit anonymity and it is usually argued that anonymity increases the response rate and may increase the likelihood that responses reflect genuinely held opinions.

There are two types of questions, namely open-ended and closed. Closed questions usually allow the respondent to choose from two or more fixed alternatives.

The advantages and disadvantages of questionnaires are listed in Table 3.2. The advantages and disadvantages of questionnaires, as stated by Burns (2000), were considered when designing the questionnaire for this study. The analysis of the data obtained from the questionnaires will represent the quantitative method of research in this study.

Questionnaires	
Advantages	Disadvantages
<p>They are less expensive to administer than face to face interviews.</p> <p>They are useful when the instructions and questions asked are simple and the purpose of the survey can be explained clearly in print.</p> <p>Each respondent receives an identical set of questions, phrased in exactly the same way.</p> <p>Errors resulting from the recording of responses by interviewers are reduced.</p> <p>The respondents are free to answer in their own time, at their own pace.</p> <p>Fear and embarrassment, which may result from direct contact, are avoided.</p> <p>A questionnaire can guarantee confidentiality and may elicit truthful responses.</p>	<p>Difficulty of securing an adequate response.</p> <p>Sampling problems could be experienced, such as a low return rate.</p> <p>Complex instruments, ambiguity or vagueness will result in poor responses.</p> <p>Ambiguous, incomplete or inaccurate information cannot be explored.</p> <p>Possibility of misinterpretation of the questions by respondents.</p> <p>The respondent's motivation for answering the questionnaire is unknown.</p> <p>There is no opportunity to obtain supplementary observational data.</p>

Table 3. 1: Advantages and disadvantages of questionnaire

(Burns, 2000)

3.5 Research instrument

For this study, reference was made to a secondary source of information which were contained in local and international articles and journals. Primary data was collected by providing online questionnaires using SurveyMonkey.

The researcher used a quantitative method using an online questionnaire so that we could analyse statistically and identify the status report on the success rate with free-form academic searching by postgraduate students

The SurveyMonkey system used provides different types of questions such as multiple choice (only one answer), multiple choice (multiple answers), rating scale, matrix of choices (only one answer per row), matrix choice (multiple answers per row) and demographic information. Moreover, SurveyMonkey offers 15 different question formats that researchers can use (see Appendix A). Other features offered include:

- online refusal;
- conditional logic questions asked depending on other answers; and
- requires answers to essential questions.

In addition, SurveyMonkey makes it easy to conduct, manage and analyse research.

The advantages of using online questionnaires (Anon, 2011a):

- The researcher has greater flexibility in displaying questions as the questions can be displayed with check boxes, pull down menus, popup menus, help screens, etc.
- Data is collected into a central database; the time for analysis is subsequently reduced.
- It is easier to rectify errors online instead of manually as the researcher does not have to reprint all the questionnaires.

3.5.1 Questionnaire layout

The questionnaire itself was subdivided into four sections and had a total of 14 questions, including multiple-choice questions, which are explained as follows:

- *Section A*: consisted of the background to the questionnaire. This section gives clear indication to the respondents about the purpose of questionnaire.
- *Section B*: consisted of questions obtaining information about the demographic features of respondents.
- *Section C*: determined the respondents' usage of the Internet search engines.
- *Section D*: was the key focus area of the questionnaire. Its function was to obtain information about the chosen search engine, the quality rate of the search engine

results, and success rate of the search engine results, general success rate when using search engines to search for academic references, query length, and query length in general when using a search engine to look for academic references.

The questionnaire was designed based on the principles and guidance of Kitchenham and Pfleeger (2002a; 2002b). All questions were self-explanatory, since it was anticipated that respondents could complete the questionnaire without guidance from the researcher. The questionnaire was tested amongst a small group of respondents having the same skills as the targeted respondents for the final questionnaire, for the researcher to determine if the questionnaire was well understood before posting it online. This pre-testing was done in line with the recommendations of Kitchenham and Pfleeger (2002c) to check that the questions are understandable to the respondents, and to ensure reliability and validity of the instruments and data.

The questionnaire was hosted on the SurveyMonkey website from 20 March 2011 to 15 June, 2011. The questionnaire structure, questions and details as it was hosted on the SurveyMonkey can be found in Appendix B.

3.5.2 Sample design

For the purposes of this research, all CPUT enrolled postgraduate students were targeted. CPUT has different campuses, namely Bellville, Cape Town, Granger Bay, Mowbray, and Wellington. At the time of the research, the postgraduate student population at CPUT was 1304 (Cape Peninsula University of Technology, n.d). A sample frame is defined by Neuman (2006:225) as a list of cases in a population or the best approximation of a given population. The samples are presented in Table 3.2.

Cape Peninsula University of Technology postgraduate student population (1304)					
Faculty	Gender		Level of study		Sample size
	<i>M</i>	<i>F</i>	<i>Masters</i>	<i>Doctorate</i>	
Applied science	61	50	96	15	16
Business	131	128	237	22	37
Education & Social Science	Sample chosen by availability/due to the departmental/course structure-all Male/Masters				6
Engineering	175	39	180	34	31
Health & Wellness	18	28	37	9	4
Informatics design	75	78	126	27	27
Total	460	323	676	107	121
The actual sample size was					1304

Table 3. 2: Research samples results

3.6 Data Collection and Analysis Procedures

The data analysis methods associated with survey research design are content analysis, descriptive statistical analysis, and statistical testing (Edwards & Talbot, 1994:98). The methods used in the analysis of data in this study were dependent on the methods used for data collection.

The researcher contacted the CPUT Information Communication Technology department to obtain the respondents' (enrolled postgraduate students) contact details. Furthermore, the researcher sent an email with a link to the questionnaire, the content of the email providing a description of the purpose of conducting the survey (Appendix C). The online questionnaire was completed by the respondents, and the researcher was then able to corroborate facts and figures and statistically illustrate it by using SurveyMonkey to export the responses to a spreadsheet and to summarize data obtained from the survey. Since, the main rule of any form of analysis is to move from raw data to meaningful understanding (O'Leary, 2004) and data collected by questionnaires is quantitative; tabular and pictorial presentation is used to illustrate the findings.

3.7 Chapter summary

In this chapter, methodological approaches were explained. Quantitative research and several research methods were outlined. Methods for data analysis were discussed. The data that was collected is statistically analysed and presented in the next chapter.

CHAPTER FOUR

RESULTS AND ANALYSIS

4.1 Introduction

This chapter records and presents the data gathered using an online questionnaire. It discusses online participants' results, analysis of the questionnaire responses and discussion.

4.2 Online participants' results

All the participants were postgraduate students studying in different faculties at CPUT. There are six faculties at the university (see Table 3.2). Out of a target group of 1304 (enrolled postgraduate students), 121 started the survey and 115 completed the survey.

The link to the questionnaire was sent via the respondents' university email addresses (Appendix D). However, most the students already have another email address by the time that they enrol at the university and this contributed to the low response received in this research feedback. From informal discussions it became clear that university email is often not read due to various reasons, such as network problems, lack of capability of large attachments and lengthy download times, to name but a few.

GroupWise was utilised to monitor the sent items. GroupWise is an email client (see Table 4.1); it operates on several server and workstation platforms. It is a collaborative software product from Novell Inc. offering email, calendar, instant messaging and document management (Anon, 2011b). The researcher could verify who opened the email; however as it shows in Table 4.1, the majority did not open the email. The researcher sent a reminder email (Appendix E). The study was closed after 14 weeks.

To	Subject	Date	Recipients#	Opened#	Delet...	Accep...	Compl...	Reple...	Folder
203107489@cput.ac.za	Fwd: Next HDC due date	2010/08/31 10:2	1	1	0			1	Mailbox
uwiris@gmail.com	Data	2010/09/03 11:5	1	0	0			0	Mailbox
ruhodeestery@yahoo.com	Fwd: FIRST CALL FOR CPUT I	2010/11/02 11:5	1	0	0			0	Mailbox
imhindou@yahoo.com	Fwd: FIRST CALL FOR CPUT I	2010/11/02 11:5	2	0	0			0	Mailbox
irisuwimana@gmail.com	Questionnaire	2011/02/09 11:2	1	0	0			0	Mailbox
irisuwimana@gmail.com	Questionnaire	2011/02/09 11:5	1	0	0			0	Mailbox
irisuwimana@gmail.com	hey	2011/02/09 01:2	1	0	0			0	Mailbox
uwiris@gmail.com	Email	2011/03/09 03:3	1	0	0			0	Mailbox
208009604	Hey	2011/04/06 10:4	1	1	0			1	Mailbox
melius@gmail.com	Postgrad std details	2011/04/06 11:5	1	0	0			0	Mailbox
203107489	testing...	2011/04/06 12:5	1	0	0			0	Mailbox
206188692	CPUT - research	2011/04/08 12:5	12	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 12:5	21	10	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	21	8	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	22	11	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	39	18	0			2	Mailbox
206188692	CPUT - research	2011/04/08 01:0	59	30	0			1	Mailbox
206188692	CPUT - research	2011/04/08 01:0	30	5	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	71	15	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	14	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	3	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	48	10	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	49	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	50	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	4	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	2	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	50	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	14	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	48	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:3	46	7	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:3	46	3	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:3	49	4	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:3	50	20	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:3	5	4	0			0	Mailbox
basadens@cput.ac.za	CPUT - research	2011/04/08 01:3	1	1	0			0	Mailbox
chisina@cput.ac.za	CPUT - research	2011/04/08 01:3	1	1	0			1	Mailbox
dewaldosterus@gmail.com	CPUT - research	2011/04/08 01:3	1	0	0			0	Mailbox
ehwaiser@gmail.com	CPUT - research	2011/04/08 01:4	1	0	0			0	Mailbox

Table 4. 1: Sent items

4.3 Data Presentation Results

Most evaluations are usually conducted by descriptive analysis of data. Jackson (2009:418) mentioned that descriptive statistics have numerical measures that describe a distribution by providing information on the central tendency of the distribution, the width of distribution, and the shape of the distribution. This is arguably that descriptive analysis is a way of summarising and aggregating results from groups. Therefore, more emphasis will be placed on descriptive analysis in these results.

4.3.1 Demographic characteristics

Demographics:

- Gender
- Age group
- Language
- Level of current degree
- Faculty in which respondent registered

Demographics allow researchers to describe the identities and characteristics of the respondents of a study.

QB1 Results by gender

The gender has been reviewed and as indicated in Table 4.2 it can be seen that the gender distribution of the respondents shows male respondents have dominated, with 64.5% male and 35.5% female respondents.

Gender		
Answer Options	Response Percent	Response Count
Female	35.5%	43
Male	64.5%	78
Answered question		121
Skipped question		0

Table 4. 2: Results obtained for gender of the respondents

A graphical representation of Table 4.2 is depicted in Figure 4.1.

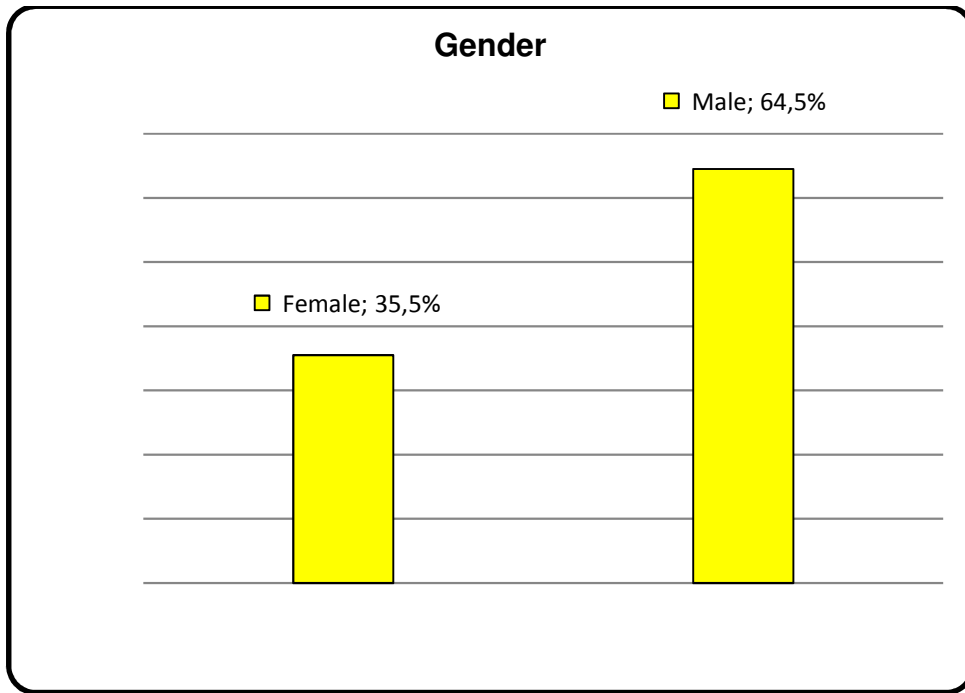


Figure 4. 1: Gender comparison

Figure 4.1 presents the gender comparison and it appears that there is a higher number of male postgraduate students, although this might be different at undergraduate level. Moreover, there is generally more male postgraduate students in CPUT than females.

QB2 Results by age group

The respondents' age groups, which is illustrated in Figure 4.2 provides interesting information, and it can be noted that most of the respondents are ages range between 21-29 years old, which accounts for 57.9% of the total respondents, representing more than half of the sample. There were no respondents who were 20 years old and younger and the minority belonged to the age bracket of 30 years and older, which accounted for 42.1% of the total respondents. It is not surprising there were no 20 year olds and younger respondents, because students with age group of 20 year old and younger are still busy with undergraduate studies.

Age group		
Answer Options	Response Percent	Response Count
20 and younger	0.0%	0
21-29	57.9%	70
30 and older	42.1%	51
Answered question		121
Skipped question		0

Table 4. 3: Results obtained for age group of the respondents

A graphical representation of Table 4.3 is given in Figure 4.2.

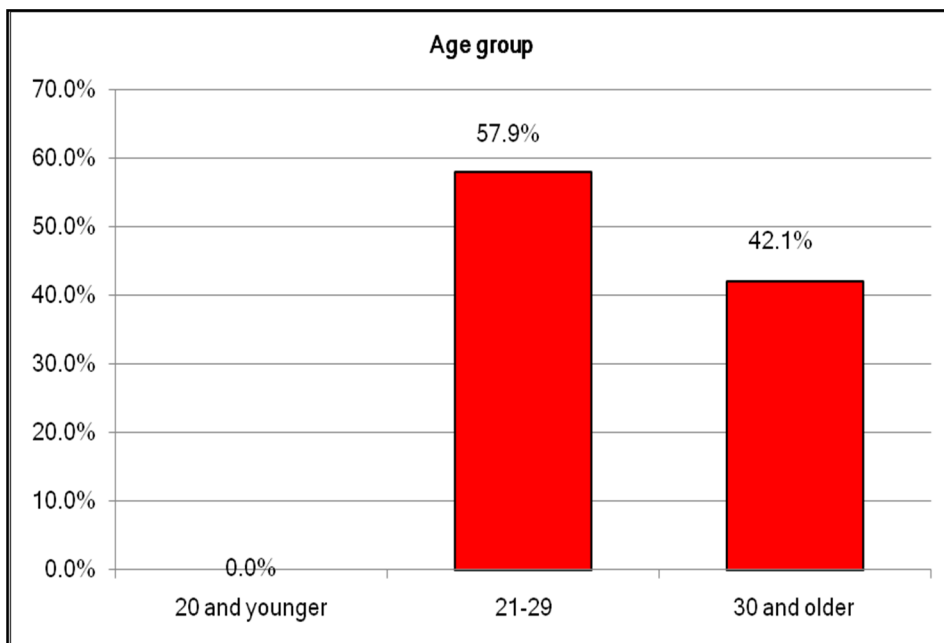


Figure 4. 2: Age group comparison

Figure 4.2 presents this demographic (age group) result in a graphical demonstration to add emphasis. It is interesting that almost half of the postgraduate students (42%) are 30 years and older, indicating that they completed their basic education before the information age (with abundance of technologies). This could have a negative impact on their information search capabilities.

QB3 Results by first language

The researcher wanted to determine the first language of the target group. From Figure 4.2, most of the respondents use other languages as their first language - 34.7% of the target group have other as their first language, Afrikaans is 15.7%,

English 33.9%, Xhosa 14.9% and Zulu 0.8%. The reason of the few Zulu responses is not surprising, as the Xhosa and Afrikaans speaking students dominate in the Western Cape more than any other province. Although the student population is more mixed and many more postgraduate students do not speak any of the listed languages, they tended to indicate English as their language.

First language		
Answer Options	Response Percent	Response Count
Zulu	0.8%	1
Xhosa	14.9%	18
Afrikaans	15.7%	19
English	33.9%	41
Other (please specify)	34.7%	42
Answered question		121
Skipped question		0

Table 4. 4: Results obtained for first language of respondents

A graphical representation of Table 4.4 is given in Figure 4.3.

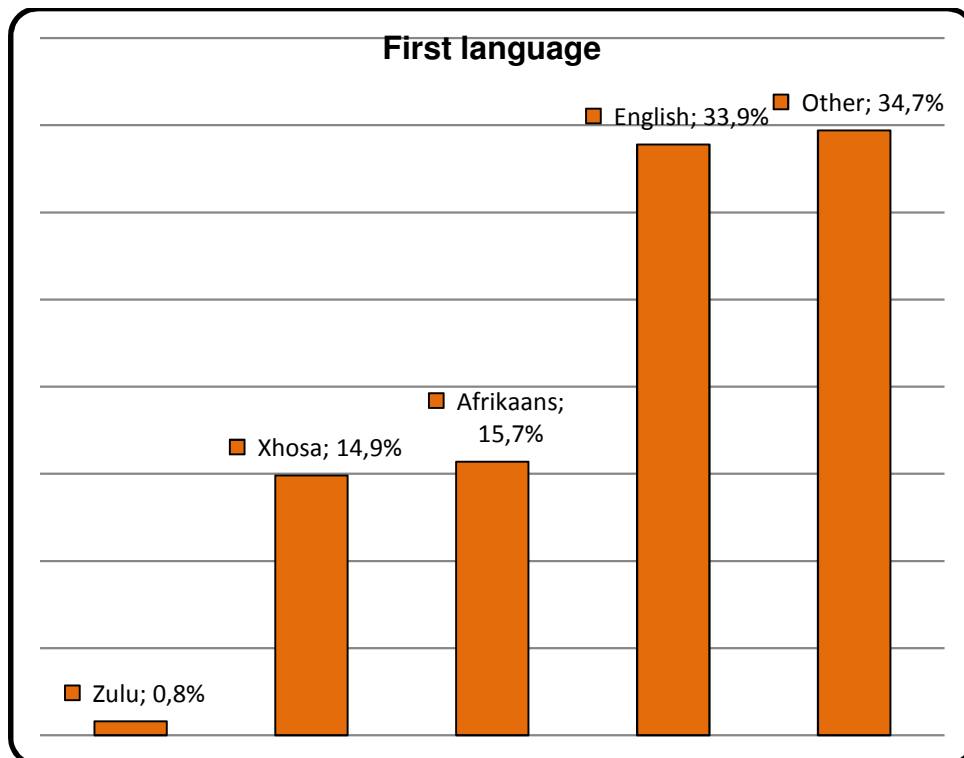


Figure 4. 3: First language comparison

The issue of language is topical in this regard, as most postgraduate students at CPUT are not first languages speakers of English (which is the medium of instruction in the university). Moreover, some postgraduate students come from other African countries where they studied in French and Portuguese for their undergraduate qualifications, which is why a large number (35%) indicated other as their first language options. This therefore represents some difficulties for the candidates in terms of their ability to conduct research in English.

QB4 Results by level of current degree

The respondents' level of education is one of the key aspects of this demographic analysis since the level of education can lead to knowledge and usability of Internet search engines. Figure 4.4 shows that the majority of the respondents were masters students which accounted for 89.3% and the minority of the respondents were doctorate students, accounting for 13%.

As shown in the Figure 4.2, most the respondent are within the age group of 20-29, and most of them are also doing their masters degrees which is what is reflected in Figure 4.4.

Current degree		
Answer Options	Response Percent	Response Count
Doctorate	10.7%	13
Masters	89.3%	108
Answered question		121
Skipped question		0

Table 4. 5: Results obtained for current degree of the respondents

A graphical representation of Table 4.5 is given in Figure 4.4.

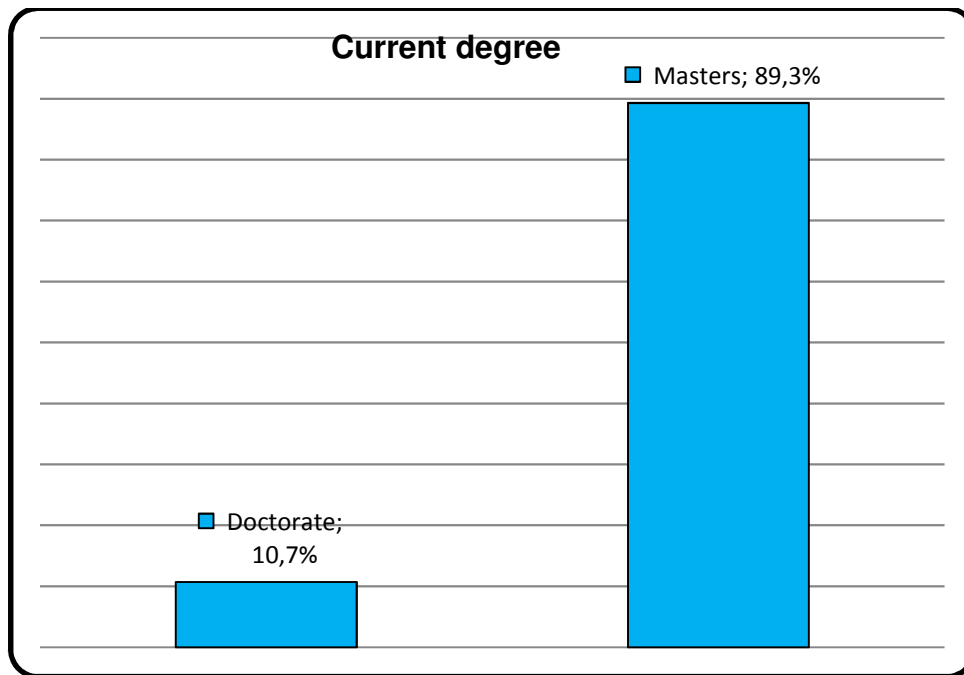


Figure 4. 4: Current degree comparison

As shown in Figure 4.4, most the postgraduate students surveyed are registered for masters with very few doctoral candidates. It would therefore not be surprising that they experience some level of difficulty in their information search capabilities, as they are still learning how to conduct independent research and how to search information.

QB5 Faculty representation

The last demographic item studied is the faculty of the respondents; the participants of this study were enrolled in all six faculties at CPUT. This analysis reveals that the faculty of Business had the majority with 31.4%, followed by Engineering with 25.6%, Informatics and Design 22.3%, Applied Sciences 13.2%, Education Social Sciences 4.1%, and Health and Wellness Sciences 3.3%. Figure 4.5 shows the frequency and percentage of each faculty.

The Business Faculty has almost half of the student population of the CPUT when it is come to student numbers and therefore it is not so surprising that most the respondents are from the Business Faculty. With regard to the rest of the faculties, the numbers are only based on the number of postgraduate students not necessary on the overall of population.

Faculty		
Answer Options	Response Percent	Response Count
Health and Wellness Sciences	3.3%	4
Education and Social Sciences	4.1%	5
Applied Sciences	13.2%	16
Informatics and Design	22.3%	27
Engineering	25.6%	31
Business	31.4%	38
Answered question		121
Skipped question		0

Table 4. 6: Results obtained for faculty of the respondents

A graphical representation of Table 4.6 is given in Figure 4.5.

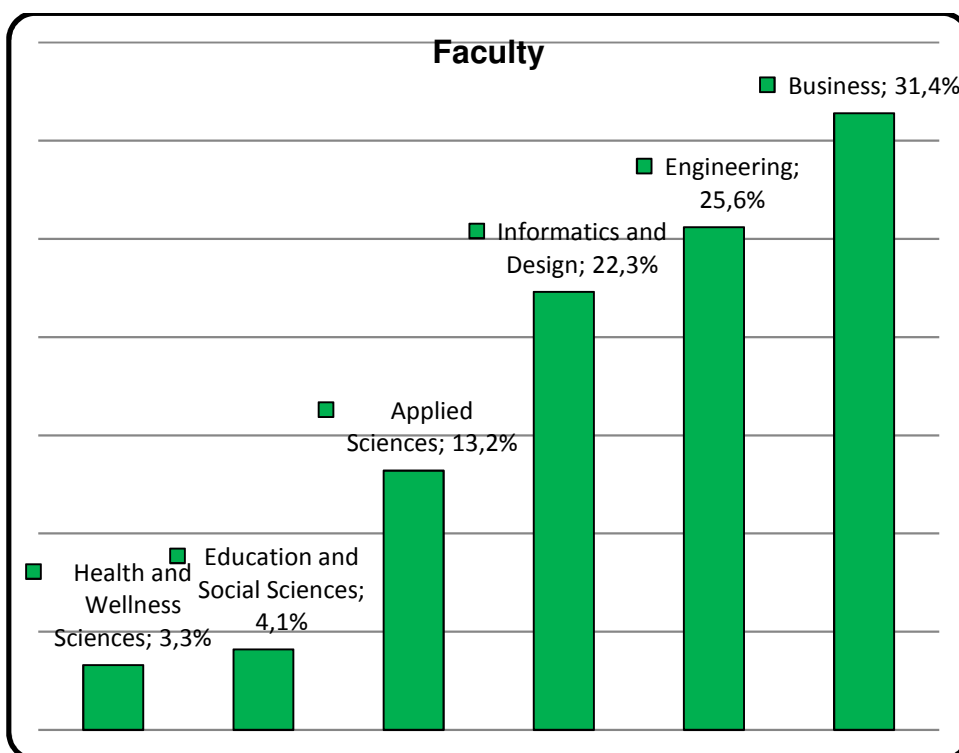


Figure 4. 5: Faculty comparison

It can be observed from Figure 4.5 that the population distribution of postgraduate students among the various faculties of the CPUT is not a balanced one. This imbalance may have resulted from the in-take and throughput rate of the number of undergraduate students. One can also observe that where there is a large number of undergraduate students, the possibility of less interaction between lecturers and students is greater. This could result in students coming onto the masters'

programme less prepared for the research journey which begins mostly with information search. It is however yet to be established whether this is the case at CPUT (in the discussion).

4.3.2 Usage of Internet search engines

QC1 Experience using Internet search engines results

To determine how much experience the target group had when using Internet search engines:

- the question was asked using a scaled answer; and
- the respondent had to answer according to their usage experience in using Internet search engines

The following chart represents the responses to QC1 on the Questionnaire.

Experience in using Internet search engines		
Answer Options	Response Percent	Response Count
More than one month but less than six months	1.7%	2
Less than a month	2.5%	3
More than six months but less than a year	2.5%	3
More than a year but less than two years	5.0%	6
More than two years	88.3%	106
Answered question		120
Skipped question		1

Table 4. 7: Results obtained for faculty experience in using Internet search engines

A graphical representation of Table 4.7 is given in Figure 4.6.

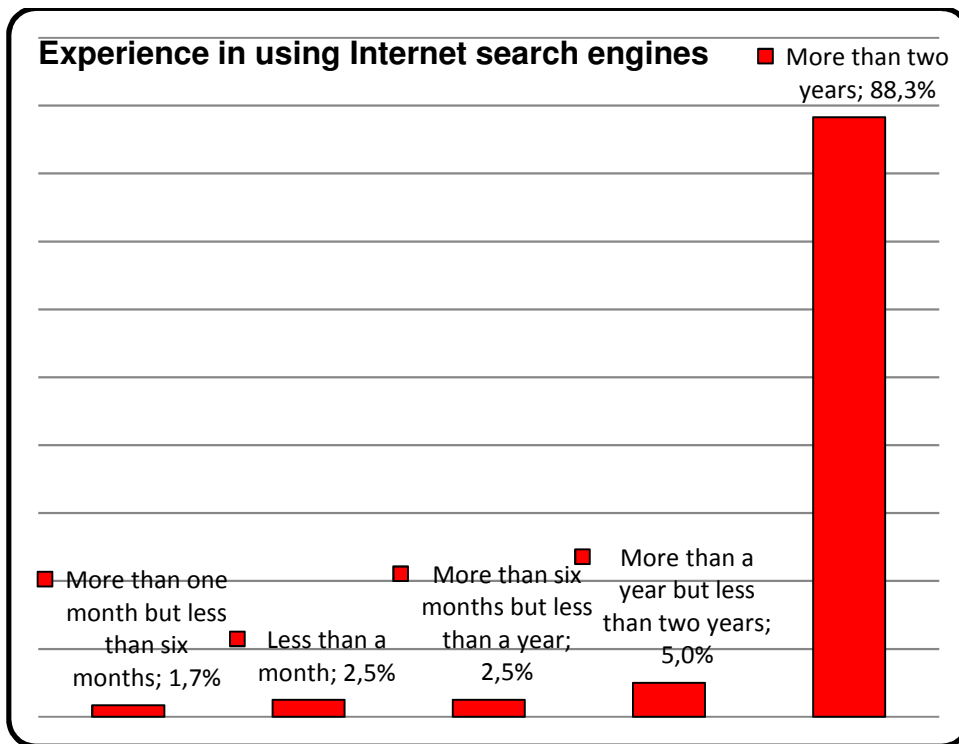


Figure 4. 6: Comparison of Internet search engines' usage occurrence

According to Table 4.7, the majority of respondents (88.3%) indicated that they have more than two years' experience in using Internet search engines, and 5% of the respondents had more than a year but less than two years' experience. Only 1.7% of the respondents had been using Internet search engines tools for more than one month but less than six months.

Since postgraduate student must rely on Internet searching for information they spend more time on Internet searching and this is the reason why there is no fewer responses for less Internet usage. Furthermore, the interpretation would then be that most the postgraduate students have used Internet search engines for a substantial time to search for information. However, this does not indicate the kind of search engines they have been using or prefer to use and as to whether they achieve any benefits in this process. The following results provide such information.

QC2 Results on frequency of using Internet search engines (i.e.: Google, Bing, Yahoo!, etc) to find academic references

Internet search engines play a crucial role in accessing information resources. The researcher wanted to determine how frequently the respondents used search engines. Both Table 4.8 and Figure 4.7 shows that most the respondents (84.2%) use Internet search engines at least once per day, and 11.7% at least once per week, whilst only 1.7% had been using it occasionally (a few times every 2-3 months).

Internet search engines' usage		
Answer Options	Response Percent	Response Count
Once or twice per month	0.0%	0
Occasionally (a few times every 2-3 months)	1.7%	2
Less often	2.5%	3
At least once per week	11.7%	14
At least once per day	84.2%	101
Answered question		120
Skipped question		1

Table 4. 8: Results obtained for Internet search engines' usage

A graphical representation of Table 4.8 is given in Figure 4.7.

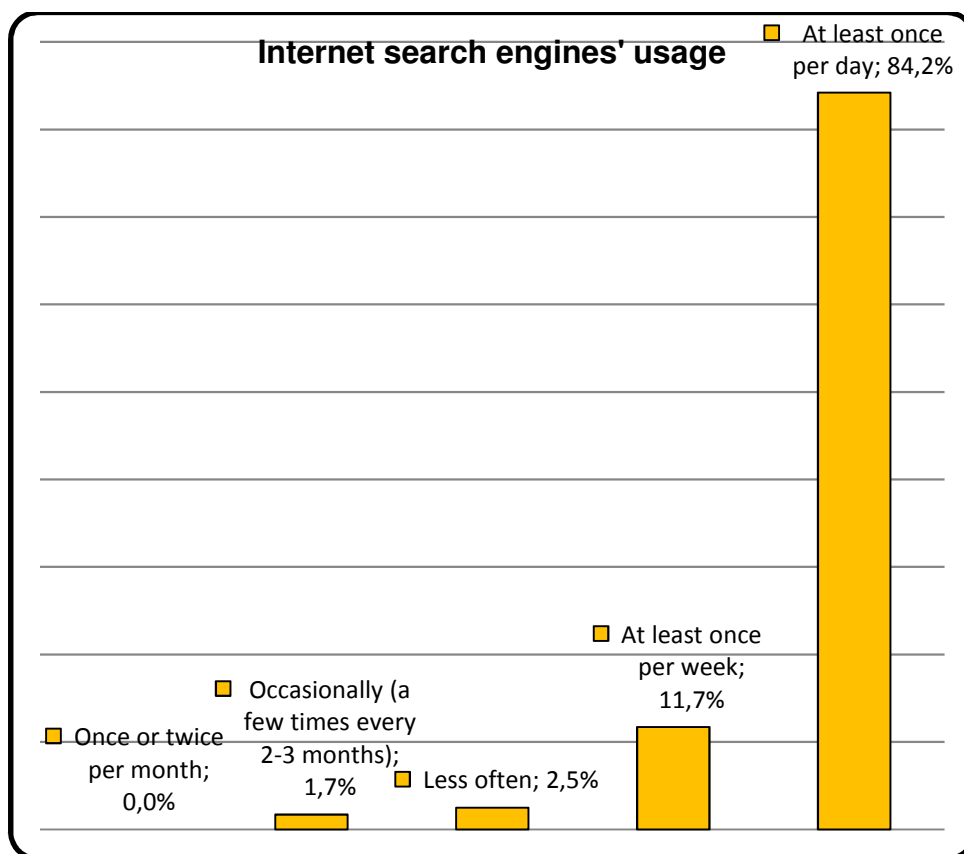


Figure 4. 7: Comparison of Internet search engines' usage

This search engine usage rate is not surprising as there are open access journals with freely available content which can be accessed through search engines. However, there is now the issue of choice as there are many search engines;

however, what motivates the choice of specific search engines is interesting to this study, and is discussed next.

QC3 Search engine services used (Google, Bing, Yahoo! and other) results

When users search for information using search engines, they do so either independently or they solicit assistance from friends and colleagues. Several studies on the information seeking behaviour of various groups of users have proven that users tend to rely on friends and colleagues as intermediaries. The researcher wanted to establish as to how the respondents decided which search engines to use. From Figure 4.8 it can be seen that most of the respondents (64.2%) were using particular search engines because of their research personal preference, 18.3% on advice from their supervisor/lecturer, 10.8% since colleagues/friends advised them to use it and 6.7% had their own preference.

Postgraduate students are usually advanced in their fields of study and therefore tend to be familiar with the databases or search engines that contain useful information, and explains the reason as to why most the respondents use their personal preference when searching for information.

Deciding which search engine to use		
Answer Options	Response Percent	Response Count
Other	6.7%	8
Colleague/friend advised to use it	10.8%	13
Advice from your supervisor/ lecturer	18.3%	22
Researcher personal preference	64.2%	77
Answered question		120
Skipped question		1

Table 4. 9: Results obtained for respondents in deciding which search engine to use

A graphical representation of Table 4.9 is given in Figure 4.8.

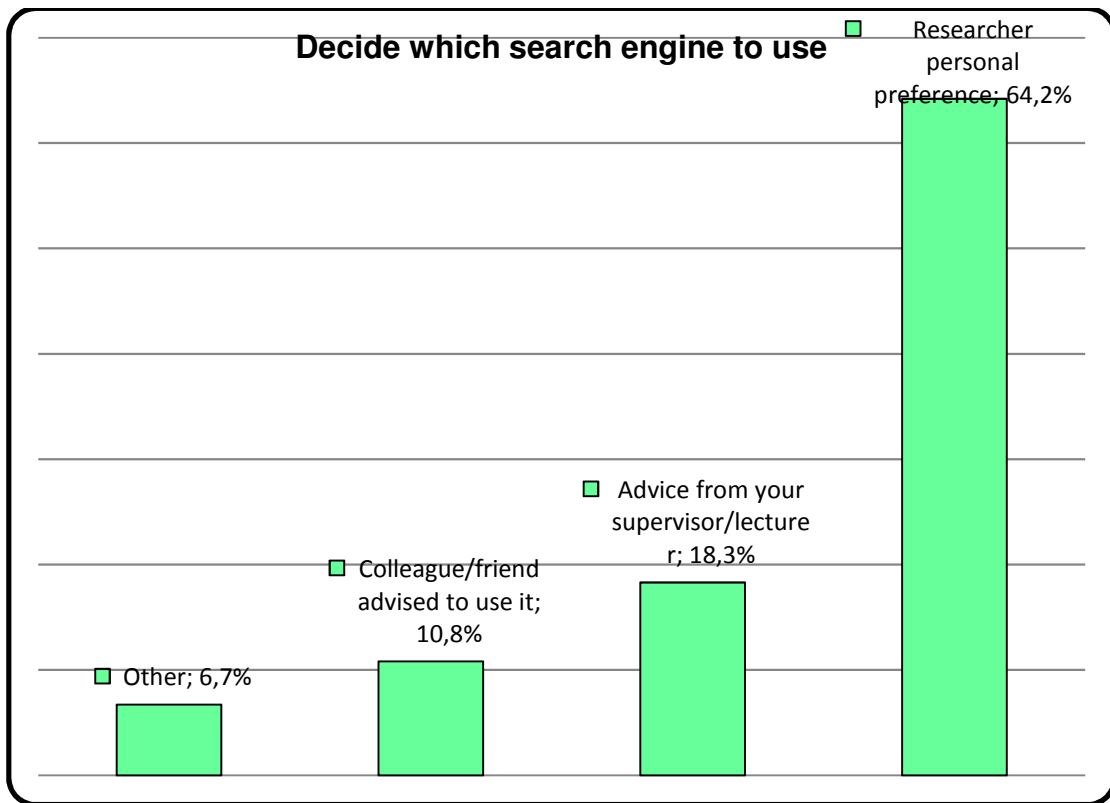


Figure 4. 8: Comparison of search engine preference

4.3.3 Search engines success

Here, the respondents were asked to open a search engine of their choice in a separate browser window. A search for academic information was then carried out, looking for:

- journal articles;
- conference papers; and
- theses.

Afterwards, the respondents used the search query results as guidance to answer the question.

QD1 Results of search engine used

After the respondents opened a search engine, Figure 4.9 shows that most the respondents (91.3%) used Google as a search engine of their choice; 6.1% of the respondents used other as their choice, while only 2.6% used Yahoo!.

The reason for most the respondents choosing Google is not surprising, as Google is the most popular search engine and Google provides many different tools and applications to use to make the search easier.

Search engine chosen		
Answer Options	Response Percent	Response Count
Bing	0.0%	0
Yahoo!	2.6%	3
Other	6.1%	7
Google	91.3%	105
Answered question		115
Skipped question		6

Table 4. 10: Results obtained on search engine chosen

A graphical representation of Table 4.10 is given in Figure 4.9.

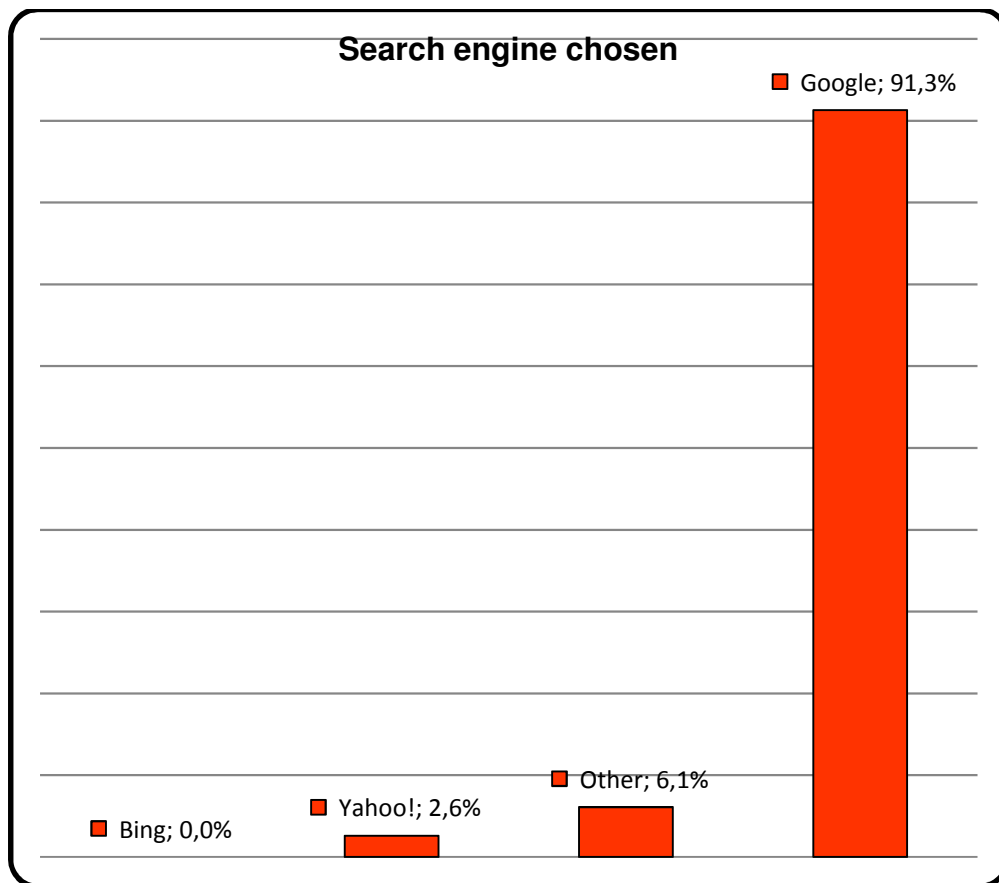


Figure 4. 9: Comparison of search engine chosen

The search engine Google possibly often presents better search results and is also user friendly. Google also appears to be research oriented with the element of Google scholar, and the storage space on the Google drive. The combination of

these could be the explanation for the high usage rate of Google. This quality of search results is therefore important in this case and is been examined next.

QD2 Quality of the search engines results

The respondents were asked to rate the quality of the search engines results as tools for retrieving search engines on the basis of a five-point scale from ‘very poor’ to ‘very good’. Results are shown in Figure 4.10. Most respondents (50.4%) considered the overall quality of search engines to be good, whereas 20% still only considered it to be moderate. Although half of respondents considered the overall quality of search engines to be good, there is still a limitation of the quality of the search engines.

Quality of the search engine results		
Answer Options	Response Percent	Response Count
Very poor	0.0%	0
Poor	0.0%	0
Moderate	20.0%	23
Good	50.4%	58
Very good	29.6%	34
Answered question		115
Skipped question		6

Table 4. 11: Results obtained for the quality of the search engines results

A graphical representation of Table 4.11 is given in Figure 4.10.

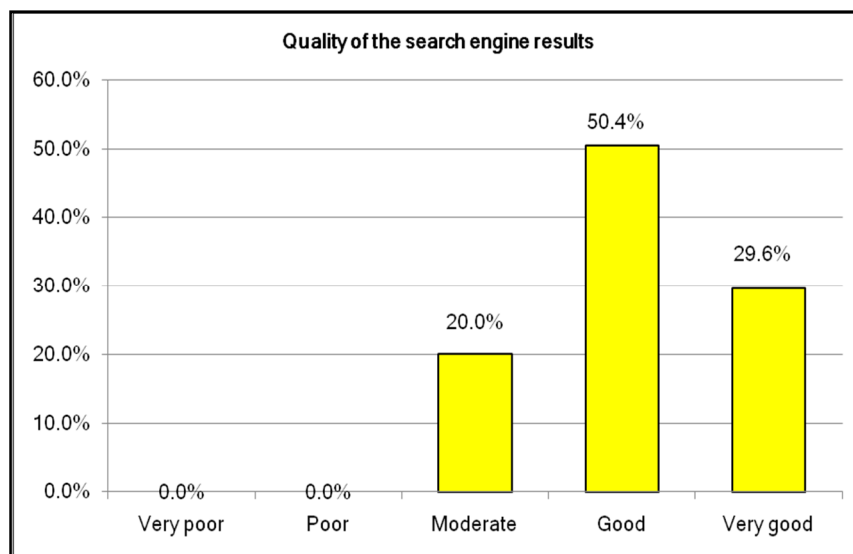


Figure 4. 10: Comparison of search result quality

QD3 Results after inspecting the first 10 results only, how would you rate the success of this research?

These results are the crucial ones of this study, and leads directly to the final conclusion. When considering the percentage results, Figure 4.11 shows that:

- most respondents, 66.1%, found related content that they can use but not exactly what they needed;
- another 28.7% of respondents found exactly what they needed and 4.3% respondents found related content but could not use it; and
- only 0.9% did not find any related content at all.

Therefore, only about 29% of the participants found exactly what they needed. This is in line with Weideman's results of a success rate of 32% (Weideman, 2001).

As shown in Figure 4.10 half of the respondents considered the overall quality of search engines to be good. Although, they found related content which could be used, as shown in Figure 4.11, the content is not exactly what they needed.

Success rate of inspected research results		
Answer Options	Response Percent	Response Count
I found exactly what I needed	28.7%	33
I found related content I can use, but not exactly what I needed	66.1%	76
I found related content but I cannot really use it	4.3%	5
I did not find any related content at all	0.9%	1
Answered question		115
Skipped question		6

Table 4. 12: Results obtained for success rate of inspected research results

A graphical representation of Table 4.12 is given in Figure 4.11.

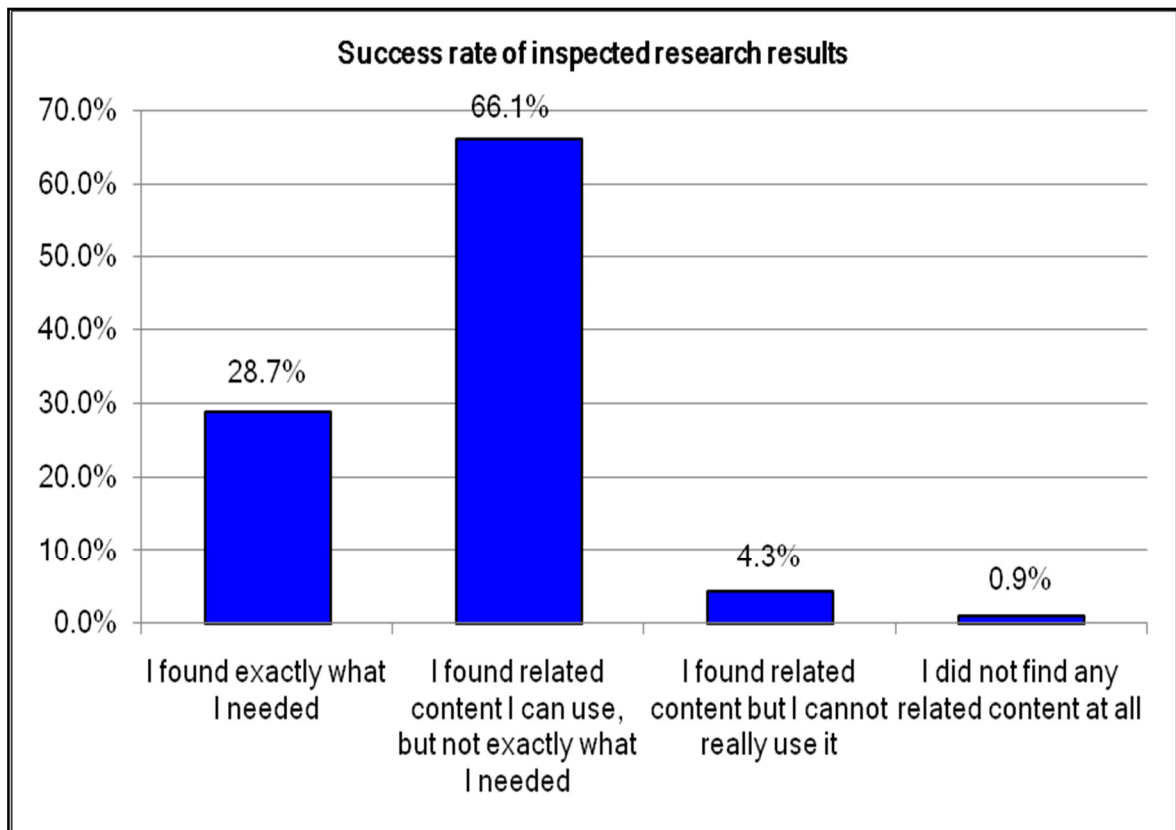


Figure 4. 11: Comparison of success rate research results

QD4 Results of general success rate when using search engines (not academic databases) to search for academic references

The respondents were asked to generalise the success rate when searching for academic information. Figure 4.12 indicates the general success rate when using search engines:

- most respondents 50.4% found the information they were looking for between 50-79% of the time;
- another 22.6% found the information they were looking for between 80-99% of the time;
- and 11.3% found the information they were looking for between 30-49% of the time;
- and
- only 3.5% found the information they are looking for less than 10% of the time.

General success rate when using search engines to search for academic references		
Answer Options	Response Percent	Response Count
Less than 10% of the time	3.5%	4
10-29% of the time	12.2%	14
30-49% of the time	11.3%	13
50-79% of the time	50.4%	58
80-99% of the time	22.6%	26
100% of the time	0.0%	0
Answered question		115
Skipped question		6

Table 4. 13: Results obtained for general success rates when using search engines to search for academic references

A graphical representation of Table 4.13 is given in Figure 4.12.

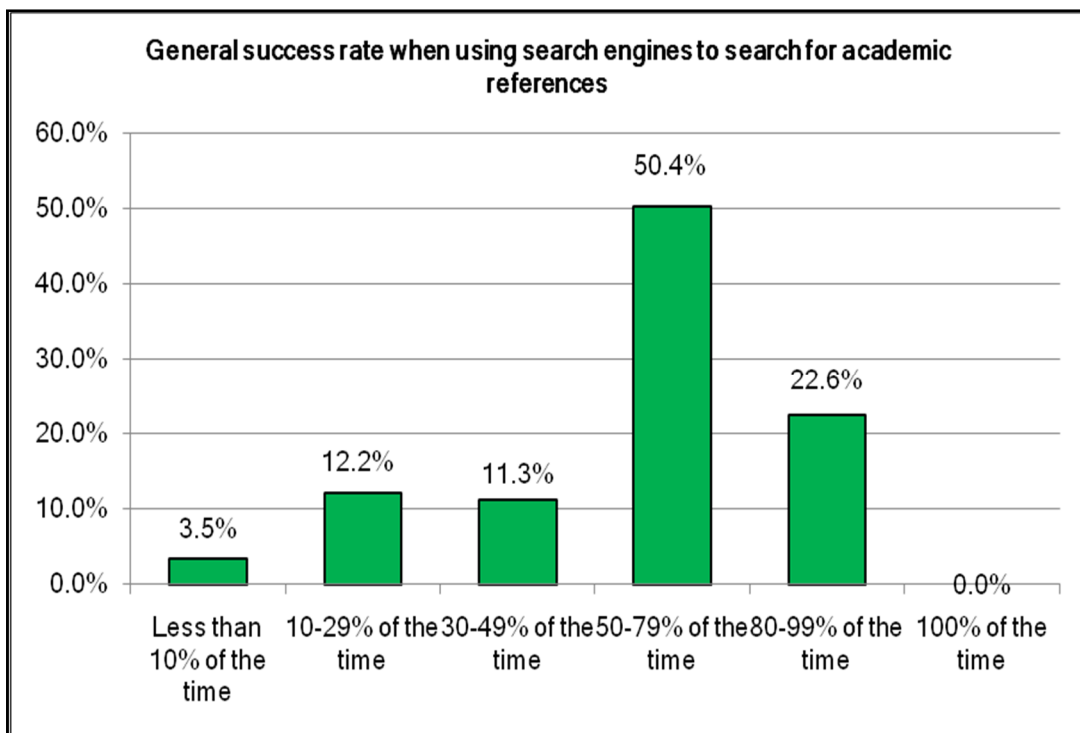


Figure 4. 12: Comparison of general success rate results

QD5 Query length for the search just completed (how many word you used) results

Figure 4.13 indicates that most respondents (33%) used three words as a search query, whereas 31.5% used more than five words. A total of 22.6% used four words, 10.4% used five words, and 2.6% used two words.

Query length for the search just completed		
Answer Options	Response Percent	Response Count
1	0.0%	0
2	2.6%	3
3	33.0%	38
4	22.6%	26
5	10.4%	12
more than 5	31.3%	36
Answered question		115
Skipped question		6

Table 4. 14: Results obtained for query length to the search completed

A graphical representation of Table 4.14 is given in Figure 4.13.

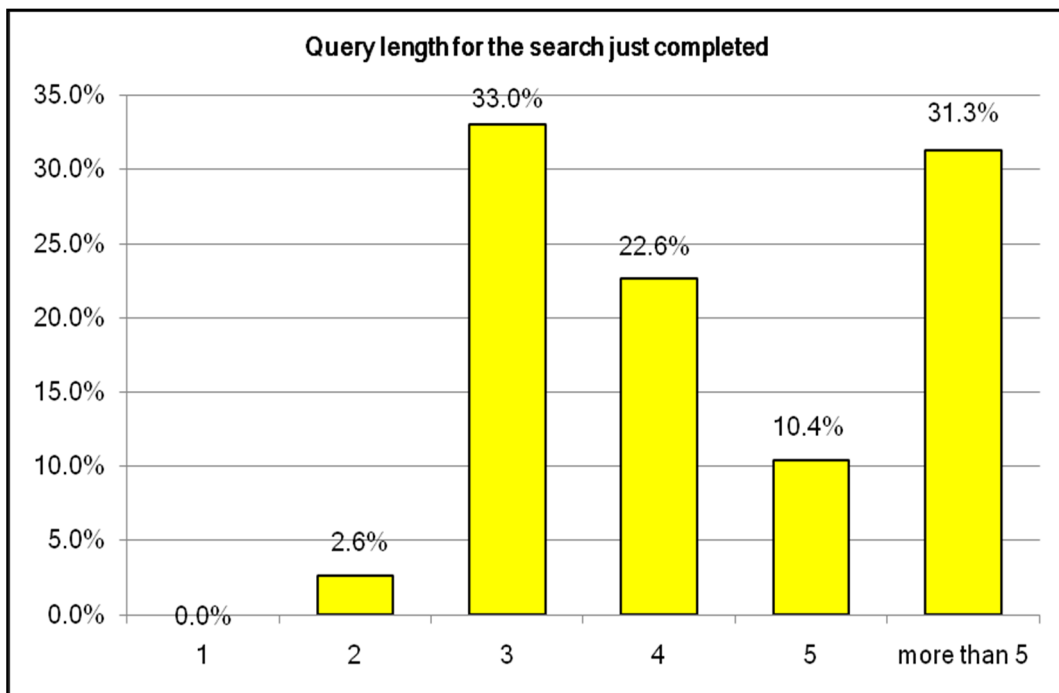


Figure 4. 13: Comparison of query length result

QD6 Query length in general, when using a search engine to look for academic references results

Figure 4.14 indicates that:

- most the respondents (31.3%) used more than five words in a search query in general to look for academic references;
- while 26.1% of the respondents used three words;

- whereas 20.9% used four words;
- 17.4% used five words; and
- some of the respondents, 3.5%, used two words and 0.90% used one word.

The results shown in Figure 4.14 are not surprising compared to previous research, there is an increase in the average query length used when searching. This increase rose sharply from two words to three words, but encountered a steady decrease from four words to five words before peaking at more than five words.

Query length in general when using a search engine to look for academic references.		
Answer Options	Response Percent	Response Count
1	0.9%	1
2	3.5%	4
3	26.1%	30
4	20.9%	24
5	17.4%	20
more than 5	31.3%	36
Answered question		115
Skipped question		6

Table 4. 15: Results obtained for query lengths in general, when using a search engine to look for academic references

A graphical representation of Table 4.15 is given in Figure 4.14.

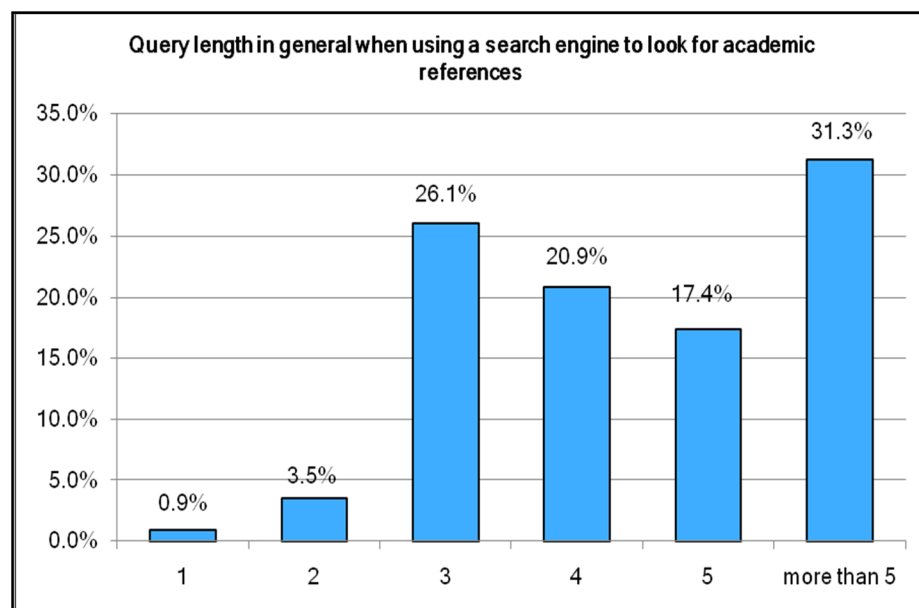


Figure 4. 14: Comparison of query length general result

4.4 Discussion

This study explored the success rate of the use of free-form information searching by CPUT postgraduate students in finding academic reference materials. The research questions were addressed by reviewing the literature, administering a questionnaire and analysing the results.

4.4.1 Demographics

In this study, the researcher examines the demographic information of the respondents from the different faculties in relation to their Internet search engines usage. The demographic distributions of the respondents have an influence on their success rate when searching information for their academic references. Of the total number of postgraduate students who took part in the survey, 5% did not complete it. Most the respondents was in the age bracket of 21-29 and this data reflected the notion that young people are more likely to use free-form Internet searching, whereas those above the age of 30 years of age are mostly the Ph.D. students. With regards to gender, the male respondents in this study comprised 64.2%. The challenge of inequality between men and women in accessing higher education exists in most developing countries even though women enrolment has in fact been increasing at a faster rate than that of men (World Bank, 1980; Council on Higher Education, 2004; Department of Higher Education and Training, 2009). However, it has been observed that the challenge of the inequality in developed countries is less compared with that of developing countries.

4.4.2 Search engines in finding academic materials/Quality of results

The study reported that the most popular search engine used was Google (see Figure 4.9). This finding is not surprising considering that this search engine has become “not just the world’s most popular Internet search engine but a verb, a household word and a cultural phenomenon” (Serjeant, 2004). Other studies of student Web information seeking have also reported that Google is the first engine of choice and the first port of call when locating information on the Web (Griffiths & Brophy, 2002). This trend is confirmed in a study conducted by George et al. (2006); it was found that for 97% of graduate students making use of Internet searching, nearly three-quarters, which amounts to approximately 73%, mention using the Google search engine when they search for information.

Findings show that respondents access Internet search engines to obtain various services for research work, such as online journals, online books, journals and article

abstracts. This can be attributed to the steady increase in Internet usage for education and research purposes (Teo, 2010; Edwards & Bruce, 2002). However, while respondents had more confidence in the search engines used, they still experienced difficulties in locating the correct information to use. As the amount of information on the WWW grows, it becomes increasingly difficult to find just what users want. While general purpose search engines, such as Google, Bing and Yahoo!, offer high coverage, they often provide low precision of the information required.

Even though the Internet is a dynamic collection, its data, users, search engines, and popular queries are constantly changing (Beitzel, Jensen, Chowdhury, Frieder & Grossman, 2007). While users attempt to search for information it is not always easy to formulate effective queries for search engines (see Figures 4.13 & 4.14). One reason for the above-mentioned comment might be the ambiguity that could arise in many of the terms used in various languages. The findings for this study show that most of the respondents use English as second language (see Figure 4.3) and it was argued that queries that have ambiguous terms may retrieve documents for which are not what users are searching. From a study of the log of a popular search engine, Beitzel et al. (2007) concluded that most queries are short (around 2 terms per query) and imprecise. This study indicates that the query lengths used by most the respondents, was more than five terms (see section 4.4). in general, when using a search engine. The study of Beitzel et al. (2007) emphasised that to formulate effective queries; users may need to be familiar with specific terminology in a knowledge domain (see 4.4.4 for details).

4.4.3 Success rate

Internet searching success rate is related to the number of results produced on a search engine result page (Weideman, 2009:5). Here in the present study, the success rate was defined as the percentage of times a participant found exactly what they required. This percentage was calculated based on the total number of successful searches on the Web and the total number of searches.

Although most of the respondents claimed that they have used Internet search engines before, this did not necessarily mean that they were competent users. Earlier studies showed that users were satisfied with their searching but knew little about Internet search engines, and this had an impact on their success rate. When the current participants were asked to report their success rate, less than 29% of the respondents found exactly what they needed. These results were in contrast to the

results from the pilot study that had a 58% success rate, but confirmed the results of an earlier study, which claimed a success rate of 32% when students were searching for one topic under controlled circumstances (Weideman, 2001). Furthermore, the 2001 study was done with undergraduate students.

4.4.4 Factors affecting searching success rate

There are many factors which affect the searching success rate - these include query length, computer competency, knowledge of query generation, perceptions of Internet search usage, and background demographics.

4.4.4.1. Query length

It is well understood and documented that in best match information retrieval systems, increased query length leads to increased performance (Belkin, Cool, Kelly, Kim, Kim, Lee, Muresan, Tand & Yuan, 2004). Query length refers to the number of words respondents type into a search box to find relevant information on the search engines. Weideman points out that using a single word for searching has a good chance of success only if the term is very specific. It has been reported that searches for general single terms are too vague to produce answers likely to satisfy an information need. Spink and Xu (2000) produced results indicating typical query lengths of between 1.5 and 2.8 words per search, with an average of 2.21. Weideman et al. (2004) reported that users specifying single word queries have a 30.3% chance of success, while those specifying two or more words weigh in at 42.3%. However, most research seems to indicate that most users specify around two words in the search box when commencing a search, but it is not the case from this study. Reading through the data it was evident that respondents' highest concentration on query length in general when using a search engine to look for academic references, is more than 5 words per search (see Figure 4.14).

It has been argued that a lack of sophistication in search query formulation exists - a total lack of ability to focus a search to eliminate the thousands, and often millions, of useless answers for users. Weideman suggested a simple solution to demonstrate one way to achieve searching success. This solution (see Figure 4.16) indicates that when an Internet search query is too short (according to Weideman one word is regarded as too short) on a search engine result page, too many answers are produced and subsequently leads to searching failure as the search focus is too wide. Yet, if a search query is too long it is likely to produce no answers from the search engine, leaving the user in a "valley of zero answers". The ideal situation is in EQUILIBRIUM. Even though this author claimed that it was not possible to suggest a single figure as being the best number of query length to use, it is suggested that a

query length of between three and six words is likely to produce the best results, based on personal experience.

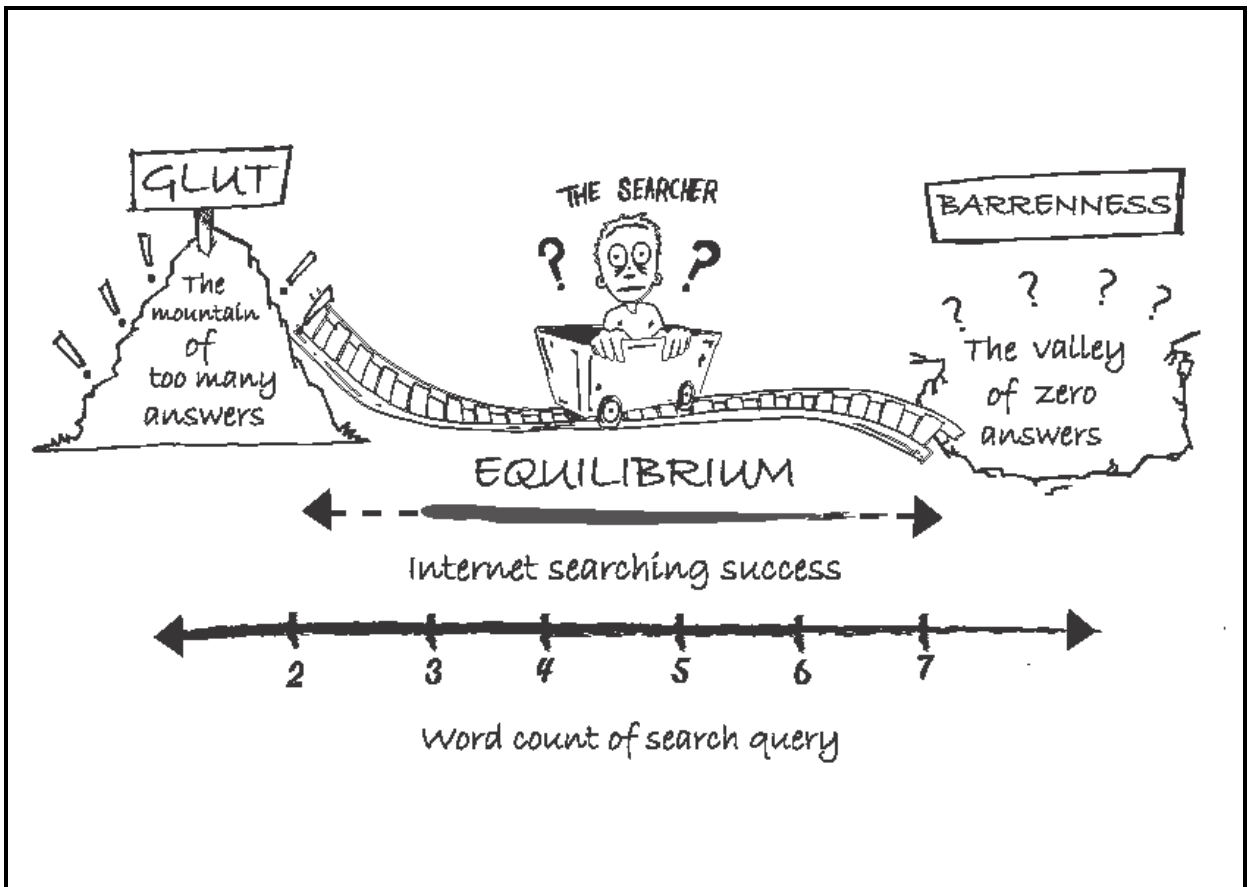


Figure 4. 15: Query length suggestions

(Weideman, 2009:9)

4.4.4.2 Free-form searching

As it was noted in this study term “free-form” refers to the use of a search engine to find information, as opposed to utilising an academic database. A free-form searching is the use of search engines to find stored data on the World Wide Web. Web search engines are positioned as the main sources of information for students and according to Bridwell (2011), Web search engines have garnered not only commercial attention but also academic attention. Web searching has become one of the most active information sources in higher education. Yet, it has been argued in the study of Tu, Shih and Tsai (2007) that to search successfully using free-form searching, users need to consider the usages of their searching strategies to generate better outcomes. According to Tu et al., searching strategies include:

- Number of keywords
- Visited pages

- Maximum depth of exploration
- Refinement of keyword and
- Number of words used in the first keyword.

These user characteristics tend to influence the overall in finding more correct answers. Considering answers from most of the respondents, this study indicates that there is an increase in the average query length when searching compared to previous research (see Section 4.4), but it is clear this did not necessarily mean they were competent users. The free-form searching is used by different groups of users for different objectives of information search, not all of them achieve their objective.

4.5 Chapter summary

This study utilised the survey approach of research, in particular the descriptive method and was designed to explore the use of free-form information searching by CPUT postgraduate students to find academic reference materials and to determine their success rate. A link to a questionnaire was sent to enrolled postgraduate students so they could complete a survey questionnaire. To determine the success rate, quantitative research techniques were used.

A survey questionnaire was prepared, and this instrument was used to determine the problems which mostly affect respondents when searching for academic references.

In this study the researcher established that:

- The most popular Internet search engine used was Google and most respondents indicated that they have more than two years' experience and use Internet search engines to search for information at least once per day.
- Less than one-third (28.7%) of respondents found the exact information they were looking for.
- Respondents' highest concentration on queries length in general when using a search engine to look for academic references is more than 5 words per search.

CHAPTER FIVE

SUMMARY AND CONCLUSION

5.1 Introduction

This chapter seeks to provide a set of strategies that can be employed in order that postgraduate students can benefit from the free-form information searching and improve searching skills.

Chapter 3 and 4 addressed the sub-questions relating to the use of the free-form Internet searching. These questions included (i) What is the free-form information searching and challenges affecting this information searching? (ii) Which search engines are used by postgraduate students, how is the search done (the query length) and what is the quality of their results? And (iii) What is the success rate with free-form Internet information searching? The aim of this chapter was to reach a conclusion of the study, based on the literature review, the research conducted, and the results of the analysis, and to propose recommendations for the way forward.

5.2 Analysis of free-form Internet Searching success rate

The findings demonstrate that respondents access search engines to obtain various services for research work and to find academic reference materials. However, upon examining the data it was evident that the respondents had more confidence in search engines used but still experienced difficulties in locating the right information. This is not surprising as the volume of Internet search is changing incrementally and this ever-growing information source has made it difficult to ascertain the quality and authenticity of information that is available to the users. In addition, search engines do not provide adequate methods to assist Internet searchers in order to access and use relevant pages.

However, Internet searchers have a low level of expertise in query building and most of these keywords are often too general (Weideman, 2010). Many Internet queries consist of only a few keywords and the results obtained with them are not always sufficient (Spink, Wolfram, Jansen & Saracevic, 2001). These results can be improved by expanding the query with additional search terms.

By comparing the literature review, the free-form Internet searching success rate, as well as the data obtained from the analysis phase, the following is suggested:

- Use a single word of searching only if the term is very specific.

- Adequate planning in advance is required.

It has been argued that many words, for example in the English language, have multiple significances. If searchers use a query in a search that is common and has numerous meanings, the result can be buried in irrelevant information. However, identifying unique phrases that relate to searchers' topics or questions is a helpful way to avoid some of these problems.

5.3 Discussion of the research objectives

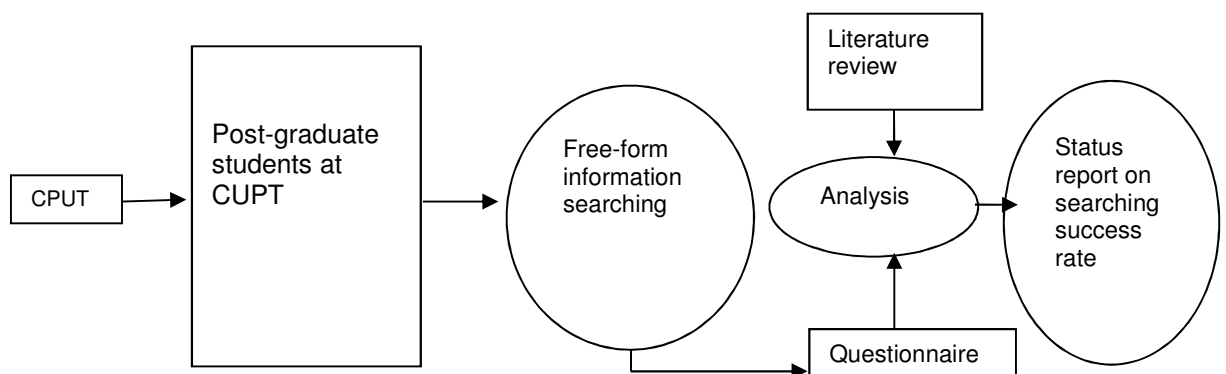


Figure 5.1: Framework

Figure 5.1 shows that for this study the focus was on postgraduate students at CPUT for their use of free-form information searching to find academic reference materials and determine their success in searching information on the Web. A literature review was conducted and quantitative method was used using online questionnaires so that the researcher could determine some of the challenges faced by postgraduate students when searching information and the factors contributing to the success rate of the sample group.

To highlight some of the challenges faced by postgraduate students when searching for information, the following information was gathered:

This study revealed that there are some challenges, as discussed in chapter two (2.7.1), with regard to postgraduate student populations in terms of age, cultural background, technological expertise and all pose challenges for information searching for their academic purposes. This study also confirmed that almost of half of the postgraduate students, 42%, are 30 years and older and that postgraduate students surveyed are predominantly registered for masters with very few doctoral candidates. This means the degree of expertise (experience level) determines the knowledge they have in searching information for their academic purposes.

To identify the factors contributing to the success rate of the sample group:

This research highlighted factors contributing to the success rate be it low or high. Similar to other research as discussed in chapter two (section 2.6) and this was confirmed, this study found the majority of postgraduate students, 84.2%, use Internet search engines at least once per day. Similarly, the issue of choice as there are many search engines; what motivates the choice of specific search engines that results in general success rates when using search engines to search for academic references. This study reveals that most postgraduate students, 50.4%, found the information they were looking for at a success rate of a percentage ranging between 50-79% of the time. The figure remains low, although the results specified a higher than average success rate.

5.4 Contribution to knowledge

This study has established a clear understanding of what challenges postgraduate students are facing, what are the specific and general success rate of postgraduate, and how that ties in when trying to acquire information for their research. Most importantly, it has been proven that the average success rate is as low as 28.7% for post-graduate searchers, and this is not considered to be satisfactory.

Some of the success factors (contributing to successful Internet searching) identified in this research project include:

- Home language (only 33.9% of respondents listed English as their home language, while all searching was done in English).
- At the same time, 88.3% of participants claimed to have more than two years of experience, and 84.2% claimed to use search at least once per day. This seems to indicate that some post-graduate students were over-estimating their own abilities.
- Query length – very few queries were in the single and double-word range, which seems to indicate that searchers in general are more sophisticated than in earlier studies. This confirms earlier findings by Davis (2007).

This research has contributed to the academic body of knowledge by providing literature for postgraduate students so that they can be aware of the challenges in order to improve to their success rate when searching for academic information using free-form search engines.

Moreover, the literature has claimed that free-form Internet searching makes it easier for researchers to access information, but this statement could not be confirmed. The literature review, analysis and data gathered from the questionnaire, indicated that the success rate could be improved. In addition to this, the author supports some research findings, stating that using a single word for searching has a good chance of success only if the term is very specific.

5.5 Limitations of the study

Although the target population was familiar to the researcher and the exchanging of ideas was easy, one of the challenges faced during this research project was to convince respondents to participate in the study.

Registered postgraduate students at CPUT were targeted with an expectation of obtaining an equal representation from all faculties, but there was a low response rate from certain faculties. While the findings may not be broad they are indicative of the factors contributing to the low rate of success.

5.6 Further research

New technologies are developed and applied to search engines on a regular basis. This may affect the complexity in searching information. Further research could broaden the criteria of the study and widen the study population to obtain clearer indications of the usage of free-form Internet searching of students based on their level of study and faculty affiliation.

Future research could be carried out to determine whether or not the results of these students specifically could be extrapolated to business in general.

5.7 Final conclusion

The quality and authenticity of ever-growing information sources have made it difficult to identify reliable information; nonetheless, free-form Internet searching continues to play a significant role as the main source in accessing of information for researchers.

According to the findings of the research, it was found that postgraduate students were aware of free-form Internet searching and were using free-form Internet searching to find academic reference materials. Google was identified as the most popular one used (not surprisingly) and it was confirmed that the respondents use one particular search engine as their personal preference (see Table 4.9). A variety of

problems experienced by postgraduate students when using free-form Internet searching were discussed.

The problems that highlight some of the challenges and factors contributing to the success rate of the postgraduate students when searching for information were mainly in:

- lack of success to specific/relevant information;
- complexity of search engine information retrieval;
- information overload; and
- lack of information literacy problems and the query length.

Although search engines can enhance the searching through a vast amount of information, it was the intention of the researcher to explore the general success rate of search engines used when searching for academic information, be it low or high. The researcher determined that search engines are still limited.

The author concluded that the research question, which reads – *What is the success rate of postgraduate students with free-form Internet information searching?* – has been successfully answered by this research. The challenges of free-form Internet searching have been determined. Even though most of the respondents are aware of free-form Internet searching and are satisfied with their searching success, Internet searching is nevertheless changing incrementally.

An encouraging trend seems to be an increase of the query length in general and this study tends to agree with Weideman's proposal model for the search query length, whereby typical lengths of searchers' queries vary between three to six words (see Table 4.14; Table 4.15 & Figure 4.16). For this study, the average length approaches more than five words per search, which is higher than most previous work indicated.

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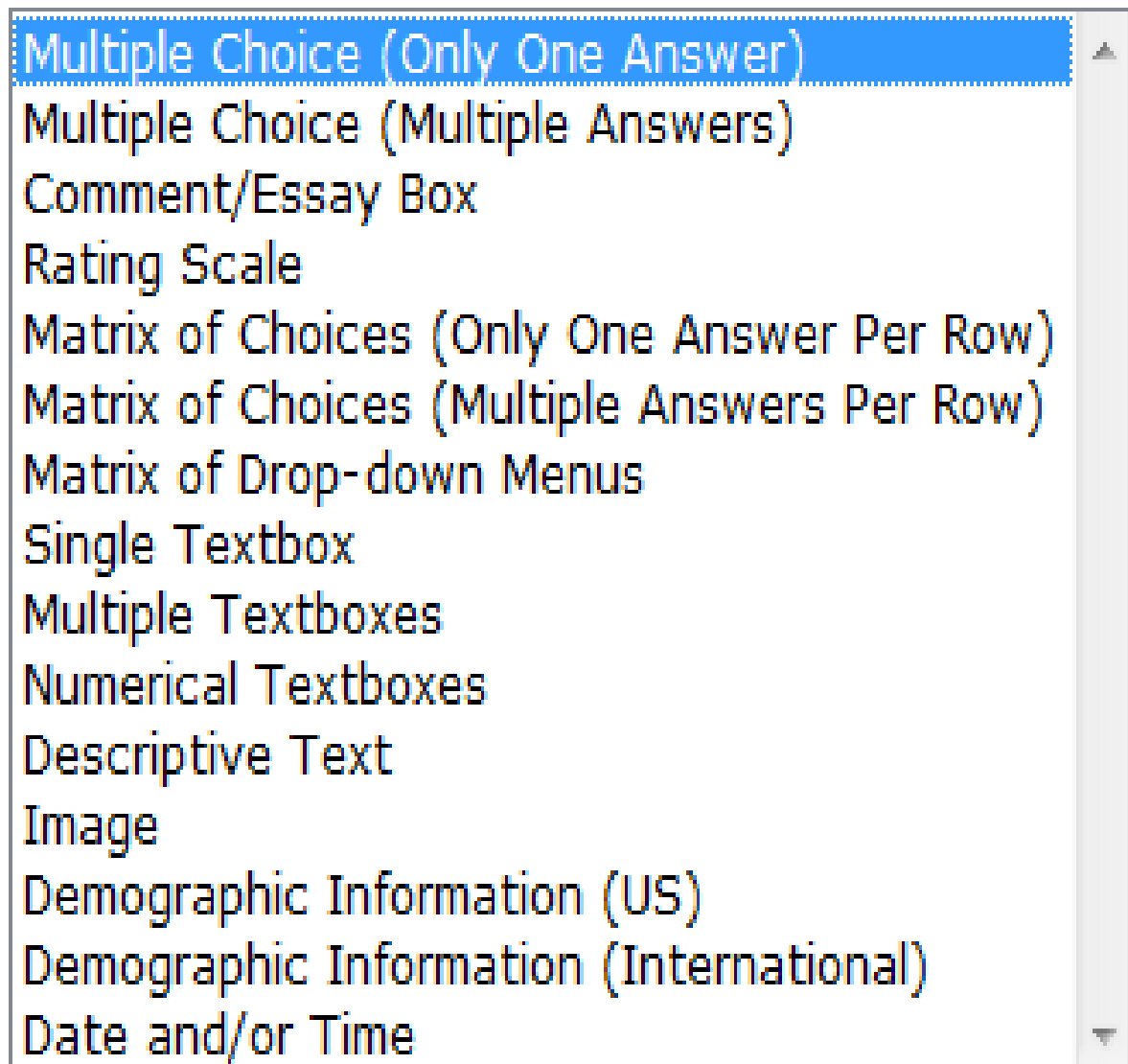
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APPENDICES

APPENDIX A: SURVEYMONKEY QUESTION TYPES



APPENDIX B: QUESTIONNAIRE

Postgraduate student success rate with free-form Internet information

1. SECTION A - BACKGROUND TO THE QUESTIONNAIRE

This Questionnaire is to be completed by postgraduate students registered at CPUT.

The purpose of this questionnaire is to investigate and assess the success rate with postgraduate students when using free-form Internet searching for academic information.

The questionnaire is expected to take approximately 15 minutes of your time.

Informed consent: Participants in this survey are assured that all information received will be treated as strictly confidential. Responses for the survey are anonymous, and participation is voluntary. No references will be made to specific individuals. All responses will be used for academic purposes and none of your details will be provided to any other person or company. Your participation in this survey is greatly appreciated.

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Please select your response to each question on the next screens.

Postgraduate student success rate with free-form Internet information

2. SECTION B - DEMOGRAPHICS

*1. What is your gender?

- Male
 Female

*2. What is your age group?

- 20 and younger
 21-29
 30 and older

*3. What is your first language?

- Afrikaans
 English
 Xhosa
 Zulu
 Other (please specify)

*4. What is the level of your current degree?

- Masters
 Doctorate

*5. Which faculty in CPUT are you registered?

- Applied Sciences
 Business
 Education and Social Sciences
 Engineering
 Health and Wellness Sciences
 Informatics and Design

Postgraduate student success rate with free-form Internet information

3. SECTION C - USAGE

*1. How much experience do you have using Internet search engines?

- Less than a month
- More than one month but less than six months
- More than six months but less than a year
- More than a year but less than two years
- More than two years

*2. How frequently do you use Internet search engines (I.e.: Google, Bing, Yahoo!, etc) to find academic references?

- At least once per day
- At least once per week
- Once or twice per month
- Occasionally (a few times every 2-3 months)
- Less often

*3. How do you decide which search engine to use? (I.e. Google, Bing, Yahoo!, etc)

- Advice from your supervisor/ lecturer
- Colleague/friend advised to use it
- Researcher personal preference
- Other (please specify)

Postgraduate student success rate with free-form Internet information

4. SECTION D - SUCCESS

Kindly open a search engine of your choice in a separate browser window. Now do a search for academic information (i.e.: a journal article, conference paper, thesis) which will be useful as a reference for your specific thesis topic.

***1. Please indicate which search engine you have chosen.**

- Bing
- Google
- Yahoo!
- Other (please specify)

***2. How would you rate the quality of the search engine results?**

- Very poor
- Poor
- Moderate
- Good
- Very good

***3. After inspecting the first 10 results only, how would you rate the success of this search?**

- I found exactly what I needed
- I found related content I can use, but not exactly what I needed
- I found related content but I cannot really use it
- I did not find any related content at all

***4. Please indicate your general success rate when using search engines (not academic databases) to search for academic references (i.e. Journal article, Online books, Abstract, etc).**

- Less than 10% of the time
- 10-29% of the time
- 30-49% of the time
- 50-79% of the time
- 80-99% of the time
- 100% of the time

Postgraduate student success rate with free-form Internet information

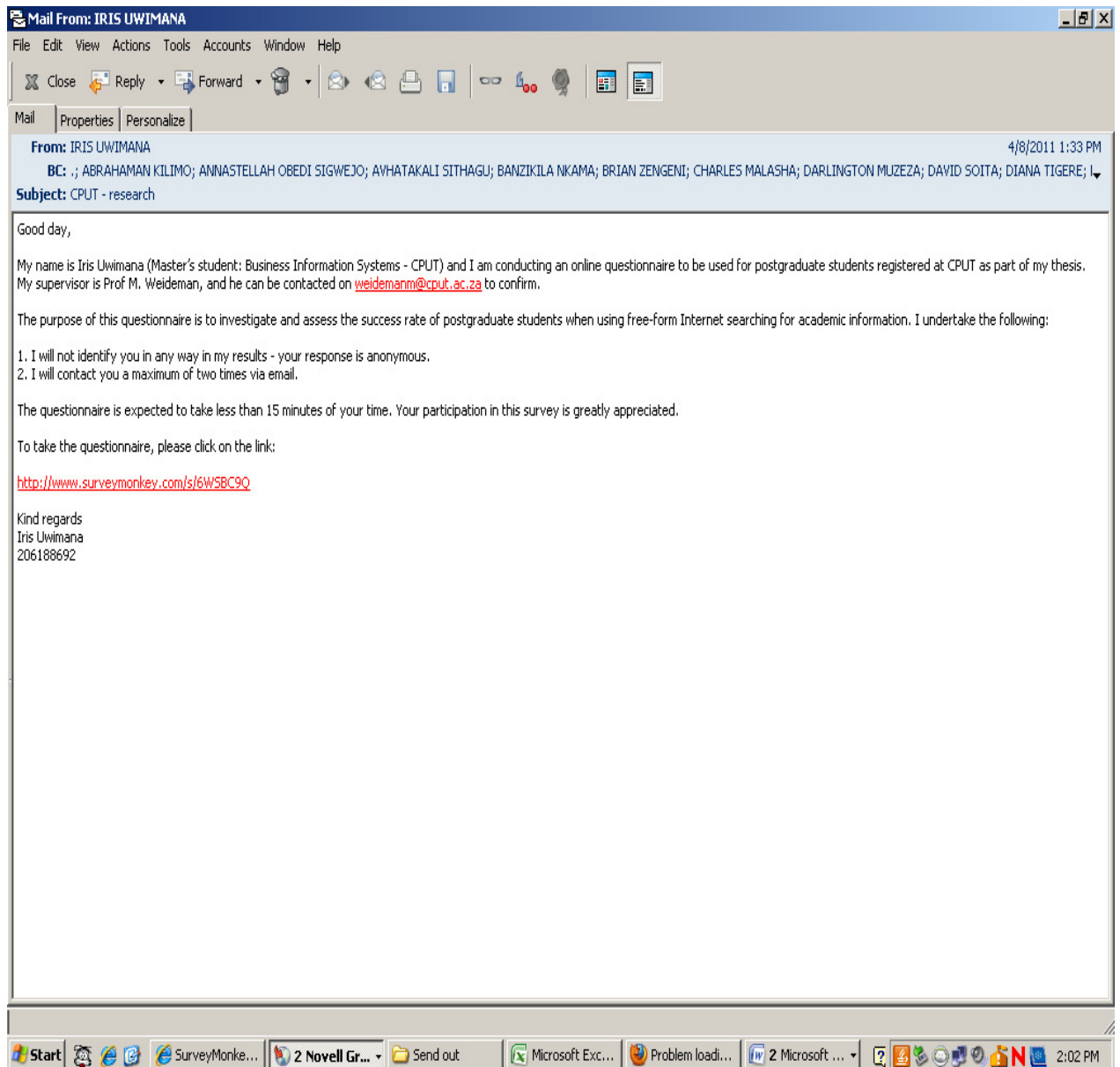
*5. Please specify your query length for the search just completed (how many word you used).

- 1
- 2
- 3
- 4
- 5
- more than 5

*6. Please specify your query length in general, when using a search engine to look for academic references.

- 1
- 2
- 3
- 4
- 5
- more than 5

APPENDIX C: QUESTIONNAIRE MESSAGE SENT



APPENDIX D: SENT ITEMS

Novell GroupWise - Sent Items

File Edit View Actions Tools Accounts Window Help

Home Mailbox[41] Calendar Sent Items Contacts

Address Book New Mail New Appt New Task

Pending Requests Delete Sent Item Retract Retract And Delete

Online X Sent Items Filter:

To	Subject	Date	Recipients#	Opened#	Delet...	Accep...	Compl...	Reple...	Folder
203107489@cput.ac.za	Fwd: Next HDC due date	2010/08/31 10:2	1	1	0			1	Mailbox
uwiris@gmail.com	Data	2010/09/03 11:5	1	0	0			0	Mailbox
ruhodeestery@yahoo.com	Fwd: FIRST CALL FOR CPUT I	2010/11/02 11:5	1	0	0			0	Mailbox
imihindou@yahoo.com	Fwd: FIRST CALL FOR CPUT I	2010/11/02 11:5	2	0	0			0	Mailbox
irisuwimana@gmail.com	Questionnaire	2011/02/09 11:2	1	0	0			0	Mailbox
irisuwimana@gmail.com	Questionnaire	2011/02/09 11:5	1	0	0			0	Mailbox
irisuwimana@gmail.com	hey	2011/02/09 01:2	1	0	0			0	Mailbox
uwiris@gmail.com	Email	2011/03/09 03:3	1	0	0			0	Mailbox
208009604	Hey	2011/04/06 10:4	1	1	0			1	Mailbox
melius@gmail.com	Postgrad std details	2011/04/06 11:5	1	0	0			0	Mailbox
203107489	testing...	2011/04/06 12:5	1	0	0			0	Mailbox
206188692	CPUT - research	2011/04/08 12:5	12	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 12:5	21	10	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	21	8	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	22	11	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:0	39	18	0			2	Mailbox
206188692	CPUT - research	2011/04/08 01:0	59	30	0			1	Mailbox
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206188692	CPUT - research	2011/04/08 01:1	71	15	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	14	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	51	3	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	48	10	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:1	49	6	0			0	Mailbox
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206188692	CPUT - research	2011/04/08 01:1	51	4	0			0	Mailbox
206188692	CPUT-research	2011/04/08 01:1	51	6	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	2	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
206188692	CPUT - research	2011/04/08 01:2	51	1	0			0	Mailbox
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206188692	CPUT - research	2011/04/08 01:3	46	3	0			0	Mailbox
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basadiens@cput.ac.za	CPUT - research	2011/04/08 01:3	1	1	0			0	Mailbox
chisina@cput.ac.za	CPUT - research	2011/04/08 01:3	1	1	0			1	Mailbox
dewaldosterus@grr	CPUT - research	2011/04/08 01:3	1	0	0			0	Mailbox
ehvisser@mail.cnr	CPUT - research	2011/04/08 01:4	1	0	0			0	Mailbox

Novell GroupWise - Sent Items										
File Edit View Actions Tools Accounts Window Help										
Home Mailbox[41] Calendar Sent Items Contacts										
Address Book New Mail New Appt New Task										
Delete Sent Item Retract Retract And Delete										
Online Sent Items Filter:										
To	Subject	Date	Recipients#	Opened#	Delet...	Accep...	Compl...	Reple...	Folder	
ziphozakshesha@	CPUT - research	2011/04/08 01:5	1	0	0			0	Mailbox	
ERIC SIMPEH	Re: CPUT - research	2011/04/11 10:4	1	1	0			0	Mailbox	
Jolanda Morkel	Re: CPUT - research	2011/04/11 10:4	1	0	0			0	Mailbox	
t_tyhlane@yahoo.	CPUT - research	2011/04/11 12:3	1	0	0			0	Mailbox	
ubcreativestudios@	CPUT - research	2011/04/11 01:1	1	0	0			0	Mailbox	
eddappiah@gmail.c	Fwd: Re: CPUT - research	2011/04/13 11:4	1	0	0			0	Mailbox	
206225695	CPUT - research	2011/04/13 03:0	1	1	0			0	Mailbox	
206188692	CPUT - research	2011/04/13 03:0	5	1	0			0	Mailbox	
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207162760	CPUT - research	2011/04/13 03:5	1	1	0			0	Mailbox	
thari14@gmail.com	CPUT - research	2011/04/13 04:0	1	0	0			0	Mailbox	
njanak@cput.ac.za	CPUT - research	2011/04/13 04:5	1	1	0			0	Mailbox	
SAMUEL KEBEDE BA	Re: CPUT - research	2011/04/14 09:1	1	1	0			1	Mailbox	
Thando Mbane	Re: CPUT - research	2011/04/14 09:1	1	0	0			0	Mailbox	
ebvisser@gmail.co	Re: CPUT - research	2011/04/14 01:5	1	0	0			0	Mailbox	
206188692	CPUT - research	2011/04/14 01:5	5	5	0			0	Mailbox	
kuakocanda1@hotm	CPUT - research	2011/04/15 10:4	1	0	0			0	Mailbox	
conradie.hendrik@	CPUT - research	2011/04/15 10:4	1	0	0			0	Mailbox	
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206188692	Reminder of CPUT - research	2011/04/18 01:5	109	32	0			0	Mailbox	
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206188692	Reminder of CPUT - research	2011/04/18 01:5	102	8	0			0	Mailbox	
206188692	Reminder of CPUT - research	2011/04/18 01:5	102	0	0			0	Mailbox	
206188692	Reminder of CPUT - research	2011/04/18 01:4	102	1	0			0	Mailbox	
206188692	Reminder of CPUT - research	2011/04/18 01:4	101	0	0			0	Mailbox	
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Melius Weideman	Re: Reminder of CPUT - rese	2011/04/18 01:5	1	0	0			0	Mailbox	
lusambakazadi@yal	Remind of CPUT - research	2011/04/19 11:1	1	0	0			0	Mailbox	
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206055706@cput.ac	Re: Reminder of CPUT - rese	2011/04/19 11:1	1	1	0			1	Mailbox	
jeanmariesabin95@	Re: Reminder of CPUT - rese	2011/04/19 11:2	1	0	0			0	Mailbox	
FERUZI, JOYCE	Re: Reminder of CPUT - rese	2011/04/21 09:5	1	1	0			0	Mailbox	
MAINGANYE, DAKA	Re: Reminder of CPUT - rese	2011/04/21 09:5	1	1	0			0	Mailbox	
Jean-Marie, Sabin	Re: Reminder of CPUT - rese	2011/04/21 09:5	1	0	0			0	Mailbox	
Mhangagwa, Tariro	Re: CPUT - research	2011/05/03 10:5	1	0	0			0	Mailbox	
ruhodeestery@yah	Fwd: Call for applications: SK	2011/05/04 09:2	1	0	0			0	Mailbox	

APPENDIX E: REMINDER MESSAGE

