Chapter 1. Background and introduction

1.1   Introduction

In this dissertation I report on the results of a needs assessment conducted to establish the electronic research needs of postgraduate students (our clients) at the University of Pretoria. The ubiquity of the Internet, iPOD, PDA, cell phone technology and other communication tools that are currently used to access the World Wide Web requires librarians and information specialists to re-evaluate the ways in which we address the research needs of postgraduate students. If one also takes into account the fact that more and more research publications such as books and journals are only published online, it becomes clear that the traditional role of the library is changing rapidly. From being places in which information is kept and stored in various ways within a physical library building, libraries are more and more becoming places in which users may access "gateways" to information that exists in a virtual environment. Basefsky (1999) writes in his article, *The library as an agent of change: pushing the client institution forward,* that, while the library "can still be a place to go for information, the emphasis must be placed on disseminating information outside its walls. The library should be going to its patrons, rather than waiting for them to appear."

Not only has the role of the library changed. Innovation and improvements in technology have caused research students to approach the library with a whole range of needs and expectations undreamed of in the non-electronic library. What research students want libraries now has changed. The way in which they communicate their needs to the library has changed. Moreover, the way in which the library addresses those needs has also changed. Such changes have compelled faculties and support services in higher education institutions to adapt themselves to the merging of the physical and the virtual campus, and to develop services that support the changing research needs of students.

Libraries that are effective and efficient are always identifying and incorporating new ways of serving the client community as best they can. A library should have a clear understanding of the needs of each of its client groups because each group has distinctive needs that are different from those of other client groups. Thus, for example, we refer to the needs of undergraduates as "learning" needs and the needs

of postgraduate students as "research" needs. Lynch (2001), Borgman (1999), and Coleman and Sumner (2004) argue that the main task of the digital libraries of the future will not be to support generalized generic access to information in large collections and databases but rather to provide "customization by community" which they define as "the development of services tailored to support the specific, and real, practices of different user constituencies". In libraries of this kind functionalities will be expressly designed to support the specific needs of particular communities of users. Basefsky (1999) notes that libraries that serve their client groups effectively possess "a detailed understanding of what their clients need".

By accepting the client-service business model, the Academic Information Service and other academic libraries in South Africa commit themselves to serving their clients in whatever ways they require. It stands to reason that if the services that these libraries offer is not satisfactory, clients will use other methods and find other places in which to pursue their research needs. One trend nowadays is that postgraduate students do not bother to struggle with complex library databases to find relevant information. This has become a source of concern to academic librarians and researchers who question the quality of research conducted in such a way. Some students, for example, would rather use Google^{TM} to search for information because it has a far more user-friendly interface than most academic databases – regardless of whether the information they retrieve from Google^{TM} is of any research value or not. Every year the Academic Information Service pays large amounts of money to obtain the most recent subscriptions to quality databases. But these databases are not being optimally utilized because of various barriers, obstacles and disincentives that I will review and discuss later on in this report.

While this dissertation reports on a needs assessment that was conducted to determine the electronic research needs of postgraduate students (i.e. clients) specifically at the Faculty of Education of the University of Pretoria, it also touches on the generic research needs of postgraduate students from the campus as a whole. The University of Pretoria clients of the Faculty of Education and Academic Information Service (i.e. the Library) at Groenkloof, Pretoria, fall into two categories. The first and largest category comprises the internal market. This consists of students who may be either undergraduates or postgraduates. It includes students from previously disadvantaged communities and distance students, students whose home language is neither Afrikaans nor English. This first category also includes the staff of the University of Pretoria and its centres. The second category comprises the external

market. This means all clients who are neither students nor staff of the University of Pretoria or its centers.

I followed a classical research cycle to obtain the results of the needs analysis. During the proposal phase I selected a focus, identified critical questions, stated a rationale for the study and conducted a preliminary literature review. After I had located a conceptual framework, I prepared a data collection plan, planned ways to analyze data, and considered issues of validity, reliability and ethics.

In Chapter 4, I identify and categorize specific needs in terms of the conceptual model proposed in Chapter 3. I conclude the study by listing the most important needs that clients have and by making recommendations about how the World Wide Web may be utilized within the virtual research environment to provide means of performing traditional tasks better, faster, more effectively and more efficiently.

1.2   Background

This study can be better understood if it is contextualized within the Academic Information Service and the University of Pretoria research environment. This I shall now undertake.

1.2.1 The Academic Information Service, University of Pretoria

The Academic Information Service is regarded as one of the best university libraries in South Africa (AIS Management Team 2004, p. 3). It provides a comprehensive information service for the university's approximately 40 761 undergraduates, 12 674 postgraduates and 1 594 academic staff members (statistics from 2004).

According to the AIS Management Team (2004, p. 5-6) two core services are offered by the library:

❐ **Information support for research** This includes a suite of services, products and facilities such as, for example, information resources and consultation services, that cater for the particular needs of students and staff who are primarily engaged in research.

❐ **Online self-help products and services** This includes a suite of online products and services that cater for the needs of clients who need to be in contact with the Internet on a 24/7 basis both on and off campus.

According to the audit report (AIS Management Team 2004) the ability of universities to contribute to international research output and to find solutions to local problems is vital for the prosperity of both university and country, and probably the biggest challenge that universities currently face. Research excellence is one of the primary goals of the University of Pretoria, as it is for the best higher education institutions throughout the world. Our clients need personalized, customized and value-added services that will forestall the ill effects of information overload and that will allow them to position themselves advantageously in the face of international competition.

Online services have become one of the fastest growing services offered by the Academic Information Service – a development that is firmly in line with international trends and with other e-university initiatives on the campus. The Academic Information Service has therefore adopted an e-learning strategy as one of its five main focus areas (AIS Management Team 2004) to address access issues. According to Engelbrecht (2003, p. 45), "[a]n e-learning strategy should maximize technology to enhance the teaching and learning process. As Internet access is becoming a given, competition among universities will be on the quality of the learning experience: quality online learning programs supported by online information, administrative and technical support services." This makes it clear that the Academic Information Service needs to be able to offer quality research support products that enhance the research process because only the best services will be able to increase the output and contribute to the success rate of qualified postgraduate students.

The five strategic focus areas that have been adopted by the Academic Information Service (AIS Management Team 2004), are the following:

❐ The e-information strategy
❐ Information for successful teaching and learning
❐ Information for successful research
❐ Information for the external market
❐ Doing more with fewer resources

Because the first and third focus areas are of particular relevance for postgraduate support, I will examine what they mean in more detail below.

Focus 1: The e-information strategy

The e-information environment sub-strategy refers to the following projects: integrated systems, integrated interface, academic tools, digital reference, ITC infrastructure, e-sources, e-dissertations, digital repositories, e-publication and digital preservation (AIS Management Team 2004). Current investigations include the following:

- ❏ Federated or metasearch product implementation, including an open link resolver
- ❏ Google Scholar[TM] implementation for easier access to the full text of articles and to references
- ❏ Implementation of an institutional research repository for the University of Pretoria
- ❏ Re-design of the web-page and services offered through the World Wide Web
- ❏ Establishing an internal web for the organization and storage of administrative documents and procedures (knowledge management)

Focus 3: Information for successful research

The increasing pressure that junior undergraduates inadvertently exert on the physical facilities and human resources of the Academic Information Service as a whole has in some instances meant that research information is being pushed into the background (AIS Management Team 2004). The AIS Management Team makes it clear that new information services and products for different categories of clients will have to be created. They envisage that special conditions will also have to be created for postgraduate students. These will include special physical and virtual areas set aside solely for postgraduates. In addition, some information specialists will have to be seconded exclusively to serve the needs of postgraduate students and active researchers.

The e-information strategy was formulated by the Management Team of the Academic Information Service to coordinate a variety of initiatives and to respond to the challenge of integrating these products and services with the university's core processes in order to (AIS Management Team 2004):

- ❒ Play an active role in and make a contribution to the international e-information phenomenon by means of, for example, open access, digital preservation, e-science and content management
- ❒ Support education innovation and research excellence at the University of Pretoria
- ❒ Deliver optimal e-information portal services that support the scientific workflow process to the clients of the Academic Information Service

The following three key sub-strategies were formulated in order to meet the above objectives (AIS Management Team 2004):

- ❒ Development of an e-information plan as part of the e-strategy of the University of Pretoria
- ❒ The creation of an e-information environment for clients that can also be referred to as a virtual research environment
- ❒ The adjustment of the structure, business processes, skills and facilities of the Academic Information Service to support the e-information strategy

According to the report (AIS Management Team 2004), a lack of resources, IT and information or knowledge management skills would severely hamper the implementation of online services. The e-learning strategy is, however, still regarded as one of the keys to sustainable services for a client population that is spread over the globe as well as for a growing proportion of the "growing up digitally" generation (the "Millennial Generation") who routinely expect to find resources and services on the Internet.

The report (AIS Management Team 2004) also makes it clear that clients are "in need of personalized, customized and value added services to overcome information overload and to compete internationally". One of the main areas of concern that the report identifies is the "[f]ocus on post-graduate students in line with campus initiatives resulting from recommendations from the HEQC (Higher Education Quality Committee) pilot audit" (AIS Management Team 2004, p. 10).

The Academic Information Service has already implemented various services, products and facilities that provide for the research needs of postgraduate students. An example of such a product is the "Research Road Map" that was compiled by the Service Unit for Health Sciences in collaboration with the Faculty of Health Sciences at the University of Pretoria. The Academic Information Service, Service Unit

Groenkloof, in collaboration with the Faculty of Education, also compiled a "research support tool" that was made available either online or as a CD ROM to postgraduate students in 2005. The online version of this tool is available at http://www.ais.up.ac.za/edu/research . Since the faculties and the Academic Information Service have been collaborating ever more closely, they no longer regard themselves as entities that function on their own.

The Department of Telematic Learning and Education Innovation also offers support to students by means of a CD ROM. The problem with such services is that because they are not coordinated, support tends to be duplicated and essential tools are not made available and marketed as they should be among academic staff and students. This is confirmed by an observation made by Boon, Bothma and Cronjé (2000): "[v]ery few e-products in libraries are the result of analysis, editing or quality control in response to user's need in terms of high quality information, accuracy, comprehensiveness, currency, reliability, validity etc." The result is that students – and specifically postgraduate students – suffer because of this lack of project coordination and quality control. The overall effect is to harm the professional image and credibility of the university, the faculty concerned and library.

What I have written above should make it obvious that serious libraries that aspire to be of an international standard have no alternative but to meet the needs of these diverse groups of users who have complex needs and special interests and demands. Departments, libraries and other support services within institutions need to cooperate to address the needs of these varied client groups. The situation at present is such that many students lack the experience to manipulate online catalogues, the skills to access specialized databases, the knowledge to find journal articles. Unhappily, they simply lack the expertise that would enable them to navigate around the resources of a modern academic library. According to Mason (2006), "graduate students are better equipped to find their way around the technological maze of today's libraries, but still require assistance from librarians". Because of its unique political history, South Africa has many features of a third-world country. This means that there are students at university (including postgraduates) from previously disadvantaged communities who very often have had no exposure to the computer technology or the Internet. If one adds to this the fact that English is often a second or third language for such students, it becomes clear that many of these students are hampered by serious disadvantages when it comes to communication.

All these difficulties create a major challenge for the staff of an academic library and research facility. The only way forward is to take account of terms of the needs analysis by creating a research environment in which postgraduate students will feel at home at the University of Pretoria because all their needs are being efficiently catered for by a staff who complies with the highest standards and best practice known in the world today.

1.2.2 The University of Pretoria

The University of Pretoria is recognized worldwide as an academic institution that focuses on teaching, scientific research and community service. It is by means of these services that the university aims at fulfilling the educational, cultural, social, economic and technological needs of the South and Southern African communities (Boon, Bothma and Cronjé 2000).

More than 550 different qualifications are offered at the University of Pretoria. It is in pursuance of these qualifications that approximately 30 000 students on the campus and approximately 28 000 off-campus students are enrolled. The student population is multi-racial and multi-cultural in composition and the teaching languages at the university are Afrikaans and English (Boon, Bothma and Cronjé 2000). Only 47% of the students who completed the questionnaire for this study spoke either English or Afrikaans as a first language. The mother tongue of 45% of the students was one of the nine other official South African languages. The mother tongue of the remaining 8% was either an African or European language. These included Fanti, Nsenga, Oshiwanabo, Shona, Ikalanga, Greek, German and Chuabo. Many of the students from previously disadvantaged communities were clients who had not been previously exposed to using computers or libraries.

Many of the university's programmes are offered in an e-learning format. The content of these courses is delivered electronically and interaction among staff and students is managed by the electronic WebCT Learning Management System. Information specialists add value to e-learning modules by contributing some of the most important bibliographical references for the courses. Links for e-learning students to full text articles are also provided. This is a great help to students who is seldom in a position to visit the campus, who cannot attend training sessions on how to search databases, and who do not have access to printed material. In this way the electronic learning management system provides a virtual learning environment for distance students and offers additional support to on-campus students in a flexi-learn

environment (Boon, Bothma and Cronjé 2000). All this is to the obvious benefit of students who are already computer-literate. But students who are not already computer-literate (such students, as was mentioned earlier, are often from previously disadvantaged communities) first need to learn all the computer routines that they need to know if they are to benefit fully from all the tools and services that are offered within a virtual or electronic research environment. While WebCT is an excellent e-learning system for supporting the *learning* needs of undergraduates, it is not necessarily the best e-research system to support the *research* needs of postgraduates and other academic researchers.

1.3   Problem statement and rationale for this study

According to a report by the Institute of Museum and Library Services (2003):

> [t]he application of computer and telecommunications technologies has changed the ways in which museums and libraries interact with their community and users. These technologies have enabled greater access for users to scientific information and resources, and have advanced educational opportunities for students across the globe. In order to measure results – to be able to state that users found what they wanted when using a specific application – one first need to understand the needs of the specific user group.

The purpose of this study is to identify and better understand the electronic research needs of postgraduate students so that the Academic Information Service (Library) can design and implement services that address those needs in a better way than the way in which they are currently being addressed.

It is for this reason that the feedback obtained from clients was more important than feedback obtained from the staff – as was the case with many earlier needs assessment studies that have been conducted. Very little research deals with needs from the clients' point of view. It is indeed true that in some cases clients are ignorant of what they really want or need. In such cases input from staff is useful. But according to Urquhart (2001): It is "only by conducting user studies [that] librarians can understand how the move to electronic resources is affecting the library's users and how the library's services can be modified to have the most positive effects".

In order to obtain a clearer understanding of the electronic needs of postgraduate students, it is helpful first to understand the *feelings* that arise in students as they attempt to utilise the services and interact with the staff of the library. "For too long, librarians have designed services and programs on *their understanding* of what is needed rather than working with academics and students in determining their information and skill needs" (Robertson 2003, p. 124). Boon, Bothma and Cronjé (2000) refer to the shift in the role of the librarian as being a shift from "knowledge of the collection, to knowledge of the users". This study should therefore be helpful to the Academic Information Service (Groenkloof) and for the other parties listed at the end of this section because it focuses specifically on the needs and feelings of students and users of the library (rather than staff) and offers some valuable insights into these needs and feelings.

According to Styles and Radloff (2000, p. 1) the feelings experienced by postgraduate students "can be characterized by six main themes: uncertainty, anticipation, effort, menace, creativity and orderliness". The staff of a library can alleviate the feelings of isolation and alienation that frequently afflict individuals engaged in postgraduate studies by offering their support whenever it is needed (J. Nieuwenhuizen, personal communication, 10 February 2005). The ability that librarians possess to eliminate the negative emotions of students as they encounter libraries in the course of their studies should never be underestimated.

This is confirmed by Newbury (1995, p. 58) when he writes:

> An understanding of the day-to-day work of research, and the way in which this articulates with a broader understanding of the place of knowledge in society is absolutely crucial, both to universities and to individual researchers. Those who are involved in funding and coordinating research have a responsibility to understand how the process of research is experienced by project researchers and students alike, and to act on this understanding to create the best possible environment for the production of useful knowledge (Newbury 1995, p. 58).

The very nature of the Academic Information Service at the University of Pretoria as a support service of the university places upon it the responsibility to create the best environment for students in partnership with the rest of the faculty and university that Newbury envisages in the quotation above.

Macauley and McKnight (1998, p. 95) elicit the following quotation in support of the view that libraries are crucial to the success of students and therefore universities themselves:

> Libraries play a key role in ensuring the success of students and, therefore, the success of universities. University libraries are simultaneously collections of books and other information resources for use by students, academics and the wider community; the principal research laboratory for many researchers, and a key locus of training for information literacy as the age of electronic information demands refined skills in seeking, evaluating and managing information resources (Darkin University, as quoted by Macauley & McKnight 1998, p. 95).

If academic libraries wish to remain the "principal research laboratory" in students' lives and justify their existence in an increasingly virtual environment, they will have to be acutely aware of and responsive to the needs of their clients and be able to help them in a world characterized by information explosion and continual technological innovation that cannot be ignored. South African students need to be helped to acquire whatever expertise and skills in research they need in this electronic environment so that they will be able to undertake high-quality research and establish themselves as lifelong researchers in a community still in transition.

In the four to five years since I began to work as an Information Specialist at the Academic Information Service (Library) of the University of Pretoria at the end of 2001, I have noticed an ever increasing demand for research support in the Academic Information Service (Library). Since I myself have been engaged in postgraduate studies in 2004 and 2005 at the University of Pretoria, I had have the opportunity from the point of view of a postgraduate to experience at first hand the kind of support services offered by the Faculty of Education and Academic Information Service. Although current technology offers ways to address client needs more than sufficiently, I noticed during this period that:

❑ support (especially online support) was not always readily available
❑ online services were not always accessible
❑ questions were not always properly and pro-actively addressed by the Academic Information Service (Library) and the Faculty of Education, University of Pretoria

It is because of these experiences that I decided to conduct a needs analysis that I thought might be useful for diagnostic and remedial purposes both to the University of Pretoria and to users outside the university who doubtless experience some of the same problems.

How this study could be useful to the University of Pretoria and Academic Information Service

This study could be useful to:

- ❐ The Academic Information Service (Library), University of Pretoria. It could help them in their efforts to align research and e-information services with the online research needs experienced by postgraduate students. It could also help them to identify those services that need additional resources if they are to solve their current problems.
- ❐ Information Specialists in the Academic Information Service. It could help them to identify, understand and focus attention on those specific needs that postgraduate students have at the present time. It is such needs after all that pinpoint exactly where a modern library service that supports an electronic environment might be failing its students and researchers.
- ❐ The Faculty of Education of the University of Pretoria as well as other faculties of the university. In recent years the large amount of research that the Faculty of Education produces has increased in volume. But not even all postgraduate students successfully complete their studies. This impacts negatively on the university because of the subsidy structure that the government has set for all universities. In years to come, higher education institutions will only receive a subsidy from government for each student who successfully completes his or her studies (J. Van Wyk, personal communication, October 18, 2004). It has therefore become a matter of vital importance for the university (as obviously for each student as well) to render as much support as possible to postgraduate students so that they bring their studies to a successful conclusion. This will go a long way towards addressing the problems of students who do not complete their studies in the required time or who do not complete their studies at all. In passing it should be noted that non-completion (for whatever reason) is a problem not only for the University of Pretoria but also for many other international universities. "A major concern of university administrations in regard to postgraduate research is the completion rates of doctoral students" (Styles and Radloff 2000, p. 1).

- The University of Pretoria as it seeks to make itself more and more attractive as a locus of postgraduate study in a highly competitive tertiary education market.
- Web-development specialists and instructional designers who are responsible for e-learning management systems at the University of Pretoria that offer online research support services.
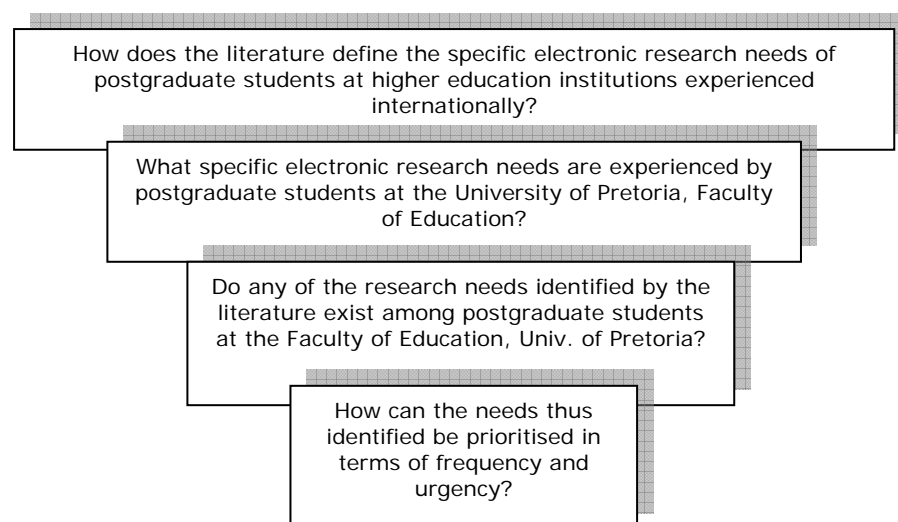
How this study could be useful to other parties

This study could also be useful to:

- National and international support staff at higher education institutions who are responsible for offering research support to postgraduate students.
- National and regional policy makers who design national standards for research in higher education.

1.4   Research questions

This study was guided by the following research questions, and in the following order (*Figure 1*):

Figure 1. Research questions

How does the literature define the specific electronic research needs of postgraduate students at higher education institutions experienced internationally?

What specific electronic research needs are experienced by postgraduate students at the University of Pretoria, Faculty of Education?

Do any of the research needs identified by the literature exist among postgraduate students at the Faculty of Education, Univ. of Pretoria?

How can the needs thus identified be prioritised in terms of frequency and urgency?

The research questions were designed firstly to establish the electronic research needs of postgraduate students operating outside South Africa, and then to narrow the study to identify the electronic research needs of students working within South Africa. My intention, once I had established these two sets of needs (i.e. international and national needs), was to ascertain to what extent these two sets of needs were similar. This information would be yielded by answering my third research question which is: "Do any of the needs identified by the literature exist among postgraduate students at the Faculty of Education, University of Pretoria?"

One of my study aims while surveying the electronic research needs of postgraduate students in the Faculty of Education was also to determine the **frequency** and **urgency** of the needs that these students expressed. Information about the frequency and urgency of their electronic research needs will give the Academic Information Service (Library) a profile of a typical e-researcher that will enable them to develop and implement research support tools that will met the needs of postgraduate students.

1.5   Terminology

In the following section, I will define my terms so that they will be contextualized within the library and information science and research environments.

1.5.1 Defining a "need"

A "need" may be defined as something someone must have in order to achieve a certain goal. A "need" as applied in information research may therefore be described as something that a student needs to complete his or her research or augment (improve) the quality of such research. These needs may include, for example, the need to communicate, access information, participate in research, be trained, consult with an information specialist (librarian), or to have easy access to online resources to which the library subscribes, as well as to the World Wide Web. In conducting research to improve qualifications, the highest possible level of one's needs is addressed – according to Maslow's hierarchy of human needs. This highest possible level of human need is (according to Maslow) the need for self-actualization (*Figure 2*) (Encyclopaedia Britannica 2006).

Figure 2. Maslow's need hierarchy

1.5.2 Defining "research"

Research may be defined as a scientific investigation into a certain field of study, that is undertaken in a diligent and systematic way in order to discover new facts or revise existing facts, theories or applications. According to Blaxter, Hughes and Tight (2002), all kinds of research share the basic characteristics of being "planned, cautious, systematic and reliable ways of finding out or deepening understanding".

1.5.3 Defining an "information need"

According to Wilson (as quoted by Van Lill 2001, p. 42): "Information needs involve the person in total: his/her cognitive processes, predispositions and socio-economic situation, which together influence his/her needs and information seeking behavior." As a prelude to designing services that will meet the information needs of clients, support staff such as librarians need to study the kind of situations in which their clients find themselves in the library and the kind of activities in which client groups engage so that they (the librarians) can deduce from these typical situations and behaviours what their information seeking behaviours are (Van Lill 2001, p. 43). "A crucial generator or source of information needs is the situation (task, problem) which causes the need" (Van Lill 2001, p. 42). But since all clients have individual needs, it is important first to identify these individual needs, and then to extrapolate

from the individual needs to the generic needs of clients as a class of users. Once this has been done, the librarian will be in a position to design a set of services that will meet the needs of each individual in that class of users (Dervin & Nilan, as quoted by Van Lill 2001, p. 43). Clients create needs as they determine and set academic goals (such as research) for themselves and these are the needs that have to be addressed by university support services such as the library.

1.5.4 Defining "electronic research needs"

"Electronic research needs" refer to the "want", "requirement" or necessity that the quality of research conducted by electronic means should be optimal and that the electronic means used to conduct such research should be (within reason and the constraints of the local situation) comparable to the best in the world. "Electronic research" refers to research conducted within a virtual research environment with the use and assistance of, for example, electronic journals, electronic books and the World Wide Web.

According to Page-Shipp, Hammes, Pienaar, Reagon, Thomas, Van Deventer and Veldsman (2005), electronic research is composed of the following elements:
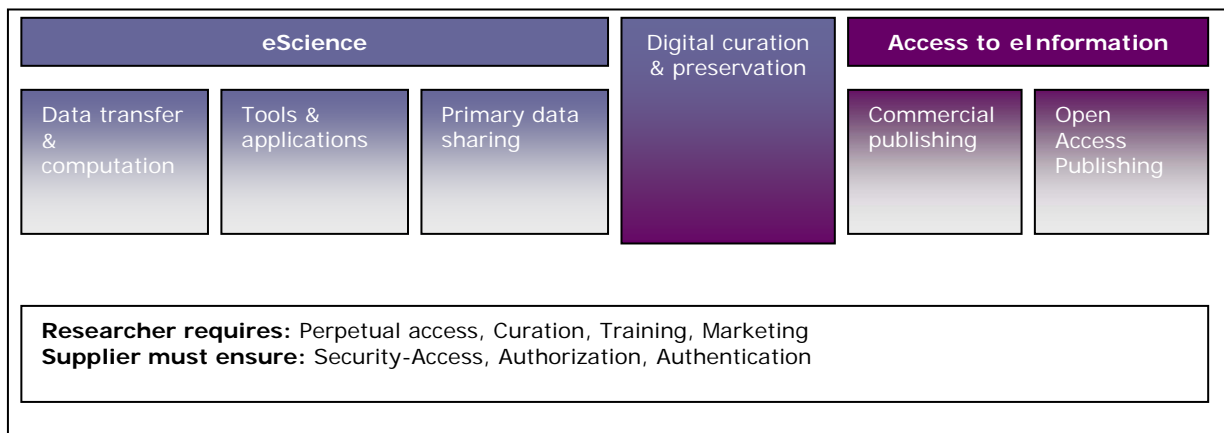
eScience:
- ❐ Data transfer and computation
- ❐ Tools and applications
- ❐ Primary data sharing
- ❐ Digital curation and preservation

Access to eInformation:
- ❐ Commercial publishing
- ❐ Open access publishing
- ❐ Digital curation and preservation

These elements may be illustrated by the following conceptual model (*Figure 3*) devised by Page-Shipp et al. (2005):

Figure 3. Elements of electronic research (Page-Shipp et al. 2005)

eScience			Digital curation & preservation	Access to eInformation	
Data transfer & computation	Tools & applications	Primary data sharing		Commercial publishing	Open Access Publishing

Researcher requires: Perpetual access, Curation, Training, Marketing
Supplier must ensure: Security-Access, Authorization, Authentication

1.5.5 A "virtual research environment" versus a "digital library"

A "virtual" or "digital" library is an extension of the traditional library. It may also sometimes replace the traditional library. According to Leiner (1998), a digital library is an access point for an electronic collection of services and information objects, that is organised in such a way that the electronic organization and presentation of those objects supports the needs of users who deal in information objects so that they can address certain higher level needs that they (these users) experience – such as the self-actualization needs that we see at the apex of Maslow's hierarchy of needs shown earlier in this text (*Figure 2*).

The phrase "virtual research environment" would also include a virtual library or digital library. But it is more than just that. A virtual research environment is mostly a research environment that has no conventional physical existence since it is constructed solely from electronic forms that only become visible through the analogues provided by electronic technology that interprets these forms in presentations that make sense to human beings operating in specific times and places and with specific cultural assumptions. Because of its unique nature, a researcher can at any time or in any place still gain access to an electronic library or virtual research environment by using Wi-Fi or a local Internet connection service provider. Since distance is a barrier to accessing conventional (non-electronic) home research libraries, researchers that are physically distant from the library are dependent on faxes and the kind of slow ("snail") mail that delivers, for example, inter-library loan material to gain access to the resources of such libraries. Because so much more research material is available nowadays in electronic format by means

of the World Wide Web, researchers looking for material in electronic format have a much greater degree of independence. Postgraduate students these days no longer have to travel long distances to access their home library collections. They can simply log on to the World Wide Web from any Internet Café or personal computer and search electronic journals, browse through electronic books or access research tools. From the researcher's point of view, this is clearly a much more cost-effective and timesaving way of conducting research.

1.6 Methodology

I approached this research in the ways described in the sub-headings below.

1.6.1 Literature survey

I approached this research firstly by conducting a literature review of research already conducted in this field. I made extensive searches in the following authoritative databases for information on the research topic:

- Academic Search Premier (EbscoHost)
- ERIC
- ScienceDirect
- Master File Premier (EbscoHost)
- ISAP (Sabinet)
- SACat (Sabinet)
- SAePublications (Sabinet)
- InfoTrac OneFile
- ABI/Infotrac
- UPExplore
- Search engines e.g. Google^{TM}, Google Scholar^{TM}, Scirus^{TM}

Although the World Wide Web offers large quantities of research material, I consulted mainly authoritative research databases such as EbscoHost (Academic Search Premier).

1.6.2 Conceptual framework

In order to organize and focus the data collection, I derived a conceptual framework (*Figure 5*) from the conceptual framework of Page-Shipp et al. (2005) that appears as

Figure 3 on page 17. The conceptual framework by Page-Shipp et al. (2005) will function in this study as a theoretical framework that conceptualises the need categories that are experienced by postgraduate students. The conceptual framework (*Figure 5*) used in this study has to be viewed within the context of constructing a possible e-service for the Academic Information Service (*Figure 4*). It will be discussed in more detail in chapter 3.

Figure 4. Contextualizing the needs of postgraduate students
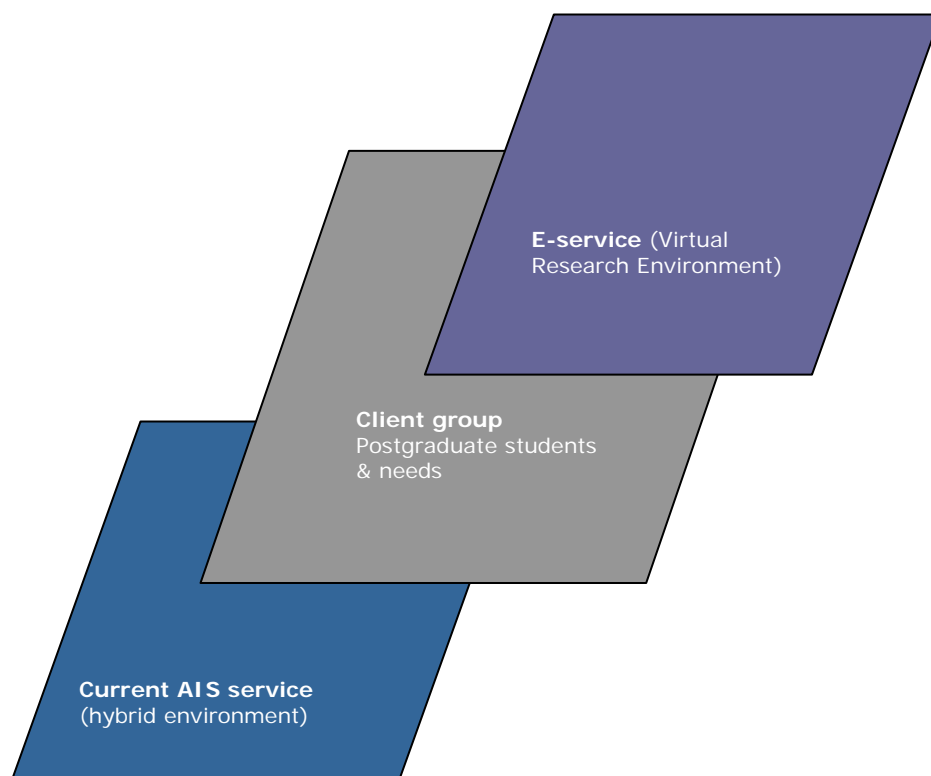
The delivery of services by the Academic Information Service currently occurs within a hybrid environment that offers access to traditional print material as well as to electronic research material. It is within this hybrid environment that the Academic Information Service should find ways that best address the research needs of this important user group while simultaneously working towards the establishment of a virtual research environment in which all electronic research needs can be addressed.

An ideal virtual research environment should address the following electronic research needs experienced by postgraduate students. These are presented in the conceptual framework illustrated in Figure 5.

*Figure 5. Conceptual framework to address **e-research needs** of postgraduate students within a virtual research environment* [The author acknowledges that she based this conceptual model on the E-Science component of the model devised by Page-Shipp et al. 2005.]
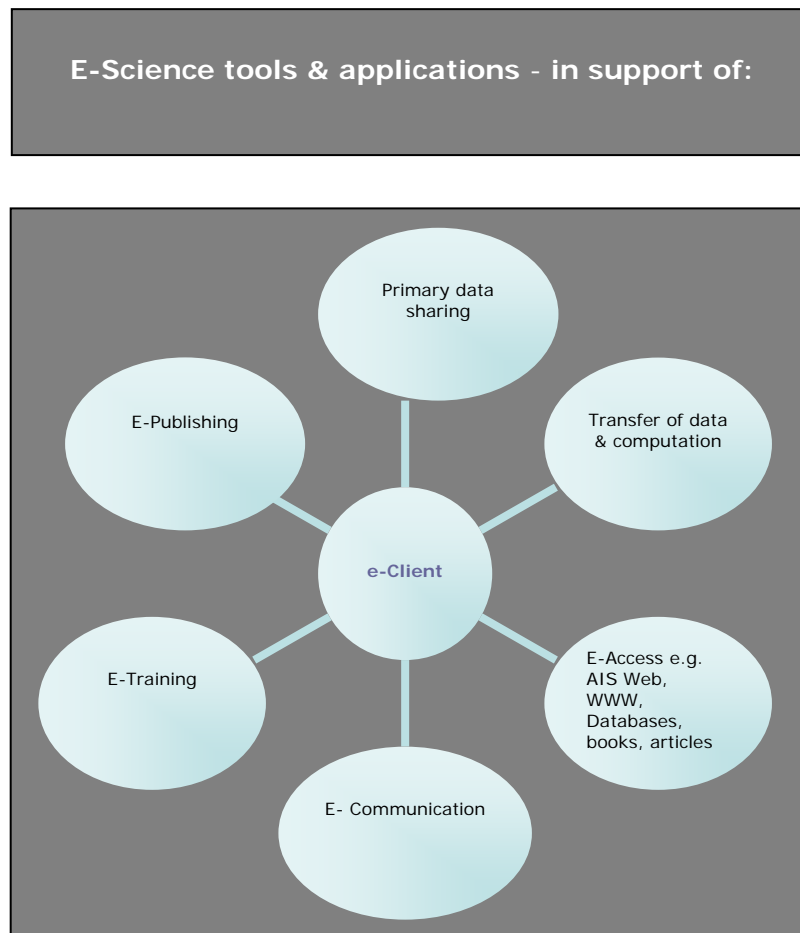
By applying the conceptual model by Page-Shipp et al. (2005) as a theoretical model within this study (as I have done above), I have been able to address the e-research needs through access to certain tools and applications that form part of the "e-Science" component of the model illustrated in *Figure 3.* I have illustrated e-research needs in the conceptual model above by highlighting specific need categories in order to identify the following e-research tools that address those needs:

- Training
- Publishing
- Communication
- Transfer of data and computation

- ❐ Primary data sharing
- ❐ Access to commercial and open access scholarly publications

E-tools and e-applications make it possible to construct the e-infrastructure for a new virtual library environment in which an e-client might feel fully at home because all his or her needs are well catered for.

1.6.3 Questionnaire and survey

1.6.3.1 Context

I conducted the research at the Academic Information Service, University of Pretoria. While the medium of instruction at the university is mainly Afrikaans, lectures classes are also given in English if there is a particular need for them.

The Faculty of Education, where I administered the questionnaire, is divided into four departments:

- ❐ Department of Curriculum Studies
- ❐ Department of Educational Psychology
- ❐ School for Teacher Training
- ❐ Department of Education Management and Policy Studies

I collected data by means of a questionnaire that I handed out during the first scheduled meeting of the NME 810 Module (Research and Methodology Module, 2005), and during library orientation sessions. The questionnaire comprised 18 questions (see Addendum C). Of these, 16 were multiple-choice questions, and two were open-ended questions.

I used data collected from a survey conducted as part of an international project called LibQUAL+^{TM} Survey (see Addendum F) to verify patterns that I identified in the data obtained by means of the questionnaire. LibQUAL+^{TM} is a suite of services offered by the Association of Research Libraries "that libraries [can] use to solicit, track, understand and act upon users' opinions of service quality" (Association of Research Libraries 2005). Users at the Academic Information Service were requested to complete the online survey over a specified period (between August and September of 2005). Respondents' answers were then sent to a central database. After that the data was analyzed by the Association of Research Libraries. The report on the findings, which reflected users' desired, perceived and minimum expectations

of the service, were made available to the Academic Information Service. The survey consisted of 41 questions.

1.6.3.2 Participants

While 122 postgraduate students from the Faculty of Education completed the questionnaire (a figure that represents 28.3% of all postgraduate students enrolled with the Faculty of Education), 716 postgraduate students from all faculties (including the Faculty of Education) (equivalent to 25.06% of all postgraduate students enrolled at the University of Pretoria in the period during which the survey was conducted) completed the LibQUAL+^{TM} survey.

1.6.3.3 Instrumentation

The instrumentation used in this research is a combination of a needs analysis questionnaire and a user survey.

The needs analysis questionnaire was designed to collect data about the preferences of postgraduate students as they use various forms of technology to further their research. The survey was designed to identify the shortcomings and deficiencies that exist in the current e-service delivery process.

1.6.3.4 Data collection

I based this research on data that I collected from a questionnaire and a user survey conducted at the University of Pretoria.

A trial questionnaire was tested before the formal questionnaire was handed out. I handed out the final questionnaire at a meeting for the Research Methodology (NME 810) Module (February 2005) for postgraduate students at the University of Pretoria as well as at library orientation sessions for postgraduate students. The postgraduate students who participated varied in progression with regard to their studies.

Table 1. Timetable for data collection

Date	Session/ Group	# of Questionnaires
22 Jan 2005	Postgraduate Orientation Session (Trial Questionnaire)	45 questionnaires handed out
10 Feb 2005	PhD Educational Management	20 questionnaires handed out
18 Feb 2005	NME 810	79 questionnaires handed out
22 Feb 2005	Library orientation	36 questionnaires handed out
August to September 2005	All postgraduate students	LibQUAL+^{TM} Survey (online survey)

1.6.3.5   Selection of participants

The participants who completed both the questionnaire and survey were not pre-selected. They also participated on a voluntary basis in the sessions in which the questionnaire was handed out.

1.6.4   Processing and analysis of data

Data from the questionnaire was processed with the assistance of *Statomet* (Department of Statistics, University of Pretoria). SAS software was used to process the data from the questionnaire. Data from the LibQUAL+^{TM} survey of the Association of Research Libraries was processed by using SPSS software. The results were made available as an online report to the Academic Information Service.

1.6.5   Research report

The process that I followed may be illustrated as follows (*Figure 6*):

Figure 6. An illustration of the research process

```
┌─────────────────────────────┐
│   Questionnaires & survey   │
│          completed          │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│      Processing of data     │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│   Derivations from data sets │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│   Interpretation of data from │
│   questionnaire and survey   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│       Research report       │
└─────────────────────────────┘
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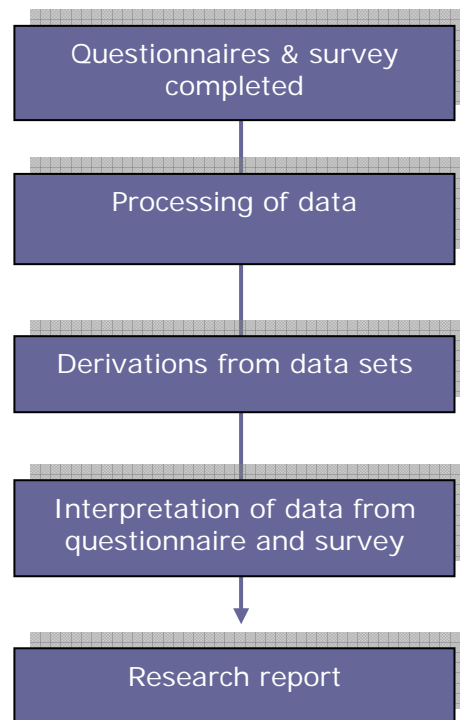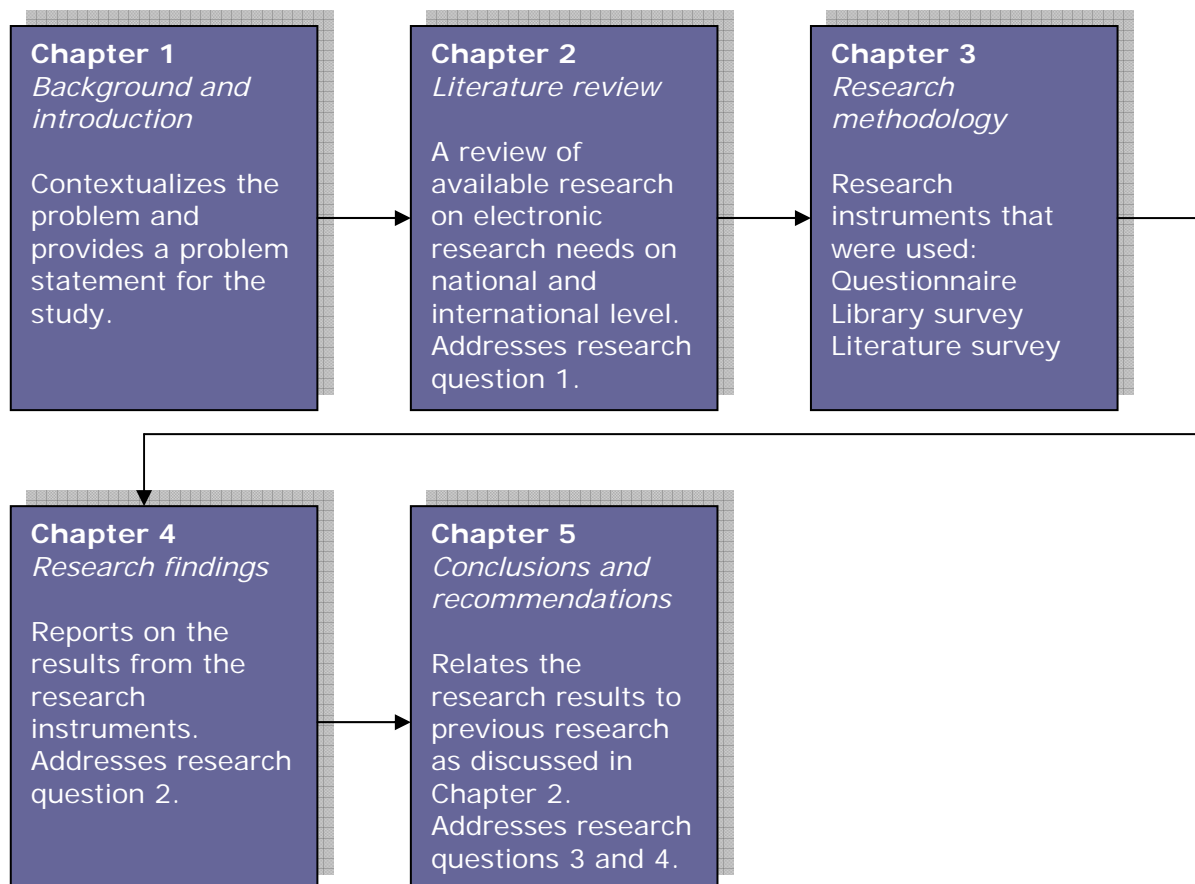
After the questionnaire and survey had been completed by the respondents, the data was processed and derivations were made. The data as interpreted is presented in chapter 4 of this research report.

1.7   Chapter outline

This research is organized into five chapters. The content of each chapter is summarized in Figure 7 on the next page.

Figure 7. Chapter outline and organisation of research

Chapter 1 *Background and introduction* Contextualizes the problem and provides a problem statement for the study.	**Chapter 2** *Literature review* A review of available research on electronic research needs on national and international level. Addresses research question 1.	**Chapter 3** *Research methodology* Research instruments that were used: Questionnaire Library survey Literature survey
Chapter 4 *Research findings* Reports on the results from the research instruments. Addresses research question 2.	**Chapter 5** *Conclusions and recommendations* Relates the research results to previous research as discussed in Chapter 2. Addresses research questions 3 and 4.	

1.8   Research outcomes

The main outcome of this research was a profile of the electronic research needs of postgraduate students in the Faculty of Education of the University of Pretoria. This profile will serve to guide and inform the process of designing services, products and tools that will be made available to support postgraduate students in their research.

1.9   Summary

In this chapter I provided a framework to situate the research problem. I used an adaptation of the theoretical framework of Page-Shipp et al. (2005) to construct the conceptual framework of this study. I have described the context within which the research was conducted and have illustrated the research process. By way of summary, the purpose of this research is to identify and better understand the electronic research needs of postgraduate students so that the Academic Information Service (Library) will be in a position to design products and services that address

those needs more effectively and comprehensively than they are currently being addressed. The effect of this research and the subsequent design and implementation of a better service for postgraduates may be greater user satisfaction on the part of the postgraduates concerned, a better understanding of the needs and feelings of clients by the librarians (information specialists) concerned, and ultimately a more satisfactory pass rate amongst postgraduate students at the University of Pretoria. This improved pass rate might then be attributable (in part at least) to the more accessible and efficient support services that take care of client needs which shall have been identified by the research undertaken in this study.