SERVICE MODEL FOR LIBRARIES IN AN AGRICULTURAL ENVIRONMENT WITH SPECIFIC REFERENCE TO THE LIBRARY OF THE ARC-SMALL GRAIN INSTITUTE

by

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DECLARATION

1. I understand what plagiarism is and am aware of the University's policy in this regard.

2. I declare that this dissertation: **'Service model for libraries in an agricultural environment with specific reference to the library of the ARC-Small Grain Institute'** is my own original work. Where other people's work has been used (either from a printed source, Internet or any other source), this has been properly acknowledged and referenced in accordance with departmental requirements.

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LIST OF ABBREVIATIONS

AACR	Anglo-American Cataloguing Rules
ACRL	Association of College and Research Libraries
AGLINET	AGricultural Libraries Information NETwork
AGORA	Access to Global Online Research in Agriculture
AGRICOLA	AGRICultural OnLine Access
ALA	American Library Association
ALIA	Australian Library and Information Association
APS	American Phytopathological Society
ARC	Agricultural Research Council
ARC-FIN	Agricultural Research Council-Finances
ARC-GCI	Agricultural Research Council-Grain Crops Institute
ARC-LIS	Agricultural Research Council-Library Information Services
ARC-SGI	Agricultural Research Council-Small Grain Institute
ASERL	Association of Southeastern Research Libraries
ASK	Anomalous State of Knowledge
BTOR	Back to Office Reports
CABI	Commonwealth Agricultural Bureau International
CAL	Canadian Agriculture Library
CALICO	Cape Libraries Cooperatives
CD-ROM	Compact Disk Read-Only Memory
CeRA	Consortium for e-Resources in Agriculture
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo = International Maize and Wheat Improvement Centre
DAFF	Department of Agriculture, Forestry and Fisheries
DARL	Defence Agricultural Research Laboratory
DDC	Dewey Decimal Classification
DEFRA	Department for Environment Food and Rural Affairs
DOAJ	Directory of Open Access Journals

DRDO	Defence Research and Development Organization
ESAL	Eastern Seaboard Association Libraries
ESALQ	Escola Superior de Agricultura “Luiz de Queiroz
FAO	Food and Agriculture Organization of the United Nation
FRELICO	Free State Libraries and Information Consortium
FSTA	Food Science and Technology Abstracts
GAELIC	Gauteng and Environs Library Consortium
GDP	Gross Domestic Product
GPS	Global Positioning System
HP	Hewlett-Packard
ICAR	Indian Council of Agriculture Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IRAC	Insecticide Resistance Action Committee
IB	Information Behaviour
IT	Information Technology
JCR	Journal Citation Reports
J-STAGE	Japan Science and Technology Information Aggregator, Electronic
JSTOR	Journal STORage
LIASA	Library and Information Association of South Africa
LIS	Library Information Services
NAL	National Agricultural Library
OA	Open Access
NLSA	National Library of South Africa
OAI	Open Access Initiative
OCLC	Online Computer Library Center
OPAC	Online Public Access Catalogue
PAR	Participatory action research
PDA	Performance and Development Agreement
PDE	Performance and Development Evaluation
PFMA	Public Finance Management Act

SABINET	Southern African Bibliographic Information Network
SAGE	SAra and GEorge [McCune]
SAIS	Southern African Interlending Scheme
SAOUG	Southern Africa Online User Group
SciELO	Scientific Electronic Library Online
SEALS	South Eastern Academic Libraries' System
SGI	Small Grain Institute
SLA	Special Libraries Association
TEEAL	The Essential Electronic Agricultural Library
TFPL	Task Force Pro Libra
TOC	Table of Contents
UK	United Kingdom
USA	United States of America
USDA	United States Department of Agriculture
WWW	World Wide Web

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SUMMARY

This dissertation reports on a study that investigated the functions and services that are rendered at the library of ARC-Small Grain Institute in Bethlehem. The study was directed by the research questions that included the investigation in library services and sources globally; the information seeking behaviour of the patrons of the library as well as the skills and competencies needed by librarians to render an effective service in a constant changing environment. These components served as a foundation for the development of a proposed service model, which reflects the incorporation of the changing roles of librarians in a research library. The current services and sources of the ARC-SGI library were discussed and compared to other libraries. A systematic review of the literature included the information seeking behaviour and information needs of researchers as well as the skills and competencies of librarians.

A mixed-method approach, using both qualitative and quantitative methods, has been applied in the study. Data was collected through questionnaires and fifteen semi-structured interviews were held with selected patrons of ARC-SGI. The findings showed that information needs depends mostly on the different stages of research and flows directly from the type of work that they do. Attention was given to preferred source choices and problems experienced during information seeking. Training needs were addressed as well as the needs for additional information needed from the library.

Based on the results, the study proposed a service model for an agricultural library. The model displays the library within the setting of an organisation as it supports the mission and vision of the parent organisation. It illustrates all the interdependent components that are essential for a successful agricultural library. The model also outlines the strategies of on-going evaluation and monitoring of the library services; the information needs and information seeking behaviour of the patrons as well as the challenges facing the library.

The study concluded by making certain recommendations that can benefit the library of ARC-SGI, which will be an improvement added to the current services. A few suggestions are made for future research, which have definite advantages for an agricultural library within an organisation.

Keywords: Information seeking behaviour, Information needs, ARC-Small Grain Institute, Skills and competencies, Agricultural researchers.

CHAPTER 1

INTRODUCTION AND OVERVIEW OF THE RESEARCH PROJECT

1.1 BACKGROUND TO THE STUDY

Libraries at research institutes play a valuable role in the research that is being conducted. Researchers depend heavily on librarians for access to information and on-going support in projects as well as postgraduate studies. According to Singh (2004, p. 299), libraries function as the nerve centre for research and teaching activities. Ochs (1999, p. 1) states that researchers in the developing countries will not know if solutions to their problems are available if they do not have access to scientific literature. Agricultural information is an important resource to help reduce poverty and improve food security (Kizilaslan 2006, p. 497). According to Raman Nair (2004, p. 1) information plays an influencing role in the efficiency of, among others, research, marketing and education. He states that the development process in agriculture rests heavily on information available to managers, scientists and farmers (Raman Nair 2004, p. 1). 'As well-equipped laboratories and field facilities are indispensable for carrying out agricultural research, well-developed libraries are essential to provide information support to researchers' (Majid, Anwar & Eisenschitz 2001, p. 176).

Since the 1970's there has been a gradual change in the way that services are being rendered. This was brought on as researchers' information needs changed, as well as with the advent of Internet and other information technologies (Ilesanmi 2013, p. 6; Nonthacumjane 2011, p. 280). The Internet and new technologies have increased the range of services that libraries can provide (Chisenga 2006, p. 5; Simmonds & Andaleeb 2001, p. 627). Due to the development in information technology (IT), the roles of librarians are constantly changing and priorities of libraries are shifted (Mi & Gilbert 2007, p. 32). 'This shift in value from a preoccupation with collections to a preoccupation with user needs is at the core of the paradigmatic shift' (Hale 1991, p. 344). Librarians also need to change and adapt to the new electronic environment (Parihar & Pattnaik 2007, p. 42).

Agricultural information is needed by several groups of people, among others, policy makers, extension officers, farmers and researchers (Kizilaslan 2006, p. 500). Libraries can support their access to, and use of information. This would require an information service developed according to the information needs and information seeking behaviour of such groups. For the purpose of this study, the researcher will mainly concentrate on the research personnel, but will also include support personnel of the Agricultural Research Council-Small Grain Institute (ARC-SGI). The ARC-SGI is situated

approximately 250-350 kilometres from the nearest university libraries; the researchers are dependent on the library for effective services and resources.

1.2 BRIEF REFLECTION ON THE HISTORY OF AGRICULTURAL LIBRARIES

To provide background to the origin of agricultural libraries, a short description regarding the history of agricultural libraries is given in the next few paragraphs.

1.2.1 International

The library of Ashurbanipal, which was discovered in the 1850's and dated back from the seventh century B.C., was considered as the oldest organised collection of records until the discovery of the tablets of Ebla (Wellisch 1981, p. 488). The tablets of Ebla date back to the middle of the third millennium B.C. with noticeable evidence of their arrangement and classification (Wellisch 1981, pp. 497-498).

Some of the oldest agricultural libraries are that of Russia (Central Scientific Agricultural Library), which was founded in 1838 (Raman Nair 2004, p. 56). In India agricultural libraries started to develop after the Department of Agriculture was established in 1873 (Raman Nair 2004, p. 61). The National Agricultural Library (NAL) of the United States of America (USA) is the largest agricultural library in the world (Tirth 1978, p. 38). It was founded on 15 May 1862 when President Abraham Lincoln signed an Act of the United States Congress whereby a Department of Agriculture was created with duties including '… to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of the word' (Paskoff 1990, p. 338; Tirth 1978, pp. 38-39). In 1962 it became the 'National Agricultural Library' (Paskoff 1990, p. 341; Tirth 1978, p. 39).

1.2.2 South Africa

According to Lor (1996, p. 236) the history of the libraries in South Africa can be traced back to countries such as the Netherlands, Germany and Britain. The purpose of the libraries was mainly education and learning and they were primarily public libraries or privately owned collections. According to Tyrrell-Glynn (1972 cited in Van Niekerk 1990, p. 15) one of these privately owned collections, namely the Von Dessin collection, contained books on agriculture that was made available to the public in 1764.

Van Niekerk (1986, p. 136) described the history of agricultural libraries in South Africa since 1900. Cedara Library is the oldest Agricultural College Library in South Africa and has existed since 1906. Elsenburg Library, an agricultural library of the Western Cape Department of Agriculture, was founded in 1936.

The Central Agricultural Library (previously the Union Buildings Library) was established

in 1910. From 1932 till 1970 it has been managed by S.J. Kritzinger, the second qualified librarian in South Africa (Van Niekerk 1986, p. 136). Perry (1956, p. 140) mentioned that the largest government library at the time was the library of the Department of Agriculture in Pretoria. It had branch libraries at four agricultural universities, regional head offices and research institutes all over South Africa (Koen 1997, n.p.). The library of the Northwest Agricultural College in Potchefstroom was one of these branch libraries – under which the library at ARC-Small Grain Institute fell until 1992, when it officially became part of the Agricultural Research Council.

1.3 AGRICULTURAL RESEARCH COUNCIL (ARC): SOUTH AFRICA

The ARC is one of the leading agricultural organisations in South Africa. It was established in terms of the Agricultural Research Act 1990 [Act no. 86 of 1990] and is a Public Entity listed in Schedule 3A in terms of the Public Finance Management Act (PFMA) Act 1 of 1999 as amended by Act no 29 of 1999. In terms of the Act, the objectives of the ARC (ARC Strategic Plan 2010/11-2014/15, p. 7) are to:

> '… conduct research, drive research and development, drive technology development and transfer in order to:
>
> - Promote agriculture and related industries;
> - Contribute to better quality of life;
> - Facilitate/ensure natural resource conservation; and
> - Alleviate poverty'.

The vision of the ARC (ARC Strategic Plan 2010/11 – 2014/15, p. 21) is:

'Excellence in research and development'.

The mission of the ARC (ARC Strategic Plan 2010/11 – 2014/15, p. 21) reads as follows:

'The Agricultural Research Council is a premier science institution that conducts research with partners, develops human capital and fosters innovation in support of the agricultural sector'.

The ARC Council, appointed by the Executive Authority (the Minister responsible for the ARC) in terms of the provisions of the Agricultural Research Council Act, 1990 (Act no. 86 of 1990), governs the ARC (ARC Annual Report 2010-2011, p. 121). The Council prepares the Annual Financial Statements at the end of the financial year and the Office of the Auditor-General is responsible for reporting on the Annual Financial Statements of the ARC (ARC Annual Report 2010-2011, p. 121).

Since the researchers of ARC-SGI falls under the Research and Development Programme of the ARC, it is necessary to bring it in perspective with the whole picture of the ARC. The ARC consists of the Research and Development Programme, Technology Transfer and Commercialisation, Human Resources and Corporate Services and Financial and Risk Management Services (ARC Business Plan 2011/2012, p. 15).

The Research and Development Programme, illustrated in Figure 1.1, are divided into the following groups (ARC Business Plan 2011/2012, p. 15):

- Horticulture Division:
  - ARC-Institute for Tropical and Subtropical Crops (Nelspruit)
  - ARC-Vegetable and Ornamental Plant Institute (Pretoria)
  - ARC-Infruitec-Nietvoorbij (Stellenbosch)

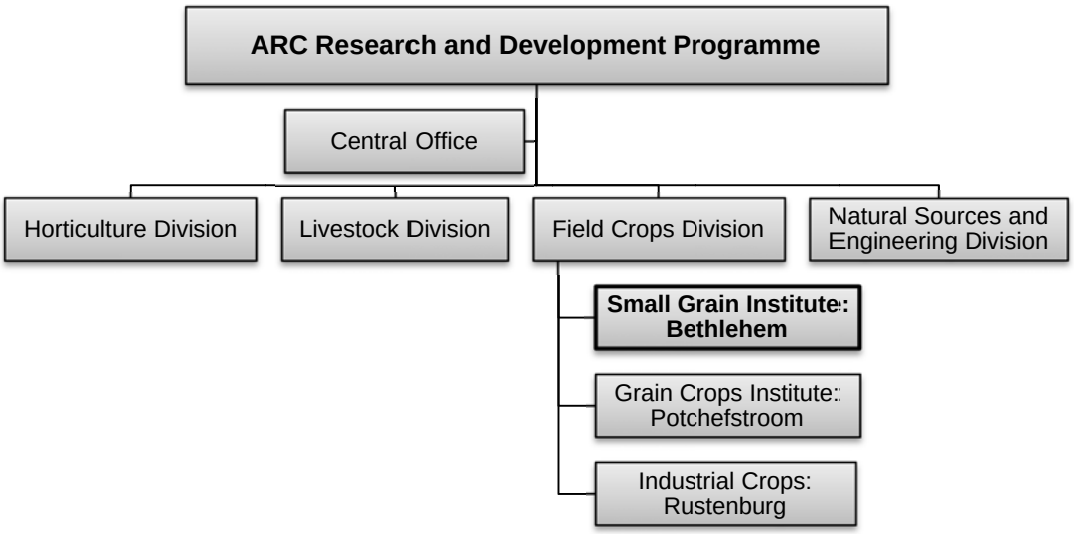
- Livestock Division:
  - Animal Health (Onderstepoort Veterinary Institute) (Pretoria)
  - ARC-Animal Production Institute (Irene)

- Field Crops Division:
  - **ARC-Small Grain Institute (Bethlehem)**
  - ARC-Grain Crops Institute (Potchefstroom)
  - ARC-Institute for Industrial Crops (Rustenburg)

- Natural Resources and Engineering Division:
  - ARC-Institute for Soil, Climate and Water (Pretoria)
  - ARC-Institute for Agricultural Engineering (Pretoria)
  - ARC-Plant Protection Research Institute (Pretoria)

- The following divisions are situated at Central Office in Pretoria:
  - Technology Transfer and Commercialisation
  - Human Resources and Corporate Services
  - Financial and Risk Management Services.

Figure 1.1: Research and Development Programme of the ARC



All the Institutes in the four Divisions as well as Central Office have its own library. The library at the Grain Crops Institute in Potchefstroom is managed by the librarian of ARC-SGI in Bethlehem. The twelve libraries are spread across South Africa, each with its own identity, but all with the same corporate goal. In support of the vision of the ARC, the libraries need to deliver service of excellence to researchers. The vision of the libraries is formulated in the ARC-LIS Strategic Plan (2010, p. 5) as:

> 'To be a future driven knowledge and information partner in research, development and technology transfer, adding value to the ARC and its stakeholders in South Africa and the African continent'.

According to the ARC-LIS Strategic Plan (2010, p. 6), the mission of the ARC libraries is:

> 'The ARC-LIS is committed to cost effective information and knowledge management that adds value to meet the information needs of the ARC and its partners and clients. In the short-term, this implies a move towards the support of eResearch'.

It is believed that libraries can play a vital role in the research activities that is being done in an academic environment (Hisle 2005, p. 175; Kuruppu & Gruber 2006, pp. 609-610).

ARC-Small Grain Institute was founded in 1947 when the Government bought four adjacent farms (Bethlehem-Landbounavorsingstasie, Verslag 1947-1953, p. 1). It was then known as 'Bethlehem Agricultural Research Station' (Bethlehem-Landbounavorsingstasie, Verslag 1947-1953, p. 1). In 1976 its name was changed to Small Grain Centre, after the visit of Dr Norman Borlaug (Figure 1.3) to South Africa. On 1 April 1992 it became part of the Agricultural Research Council (ARC). On 1 April 1995 Small Grain Centre was officially renamed as ARC-Small Grain Institute. ARC-Small

Grain Institute is situated 11 kilometres outside Bethlehem in the Free State Province. Currently it consists of six farms, namely Loch Lomond, Lomond Bank, Dankbaar, Berlyn, Provo and Heuningdraai, with a total area of 934 ha (ARC Summary of SGI activities 2006, pp. 1 of 1). A part of ARC-SGI is shown in Figure 1.2 below, indicating the position of the library.

Figure 1.2: Part of ARC-Small Grain Institute

Bethlehem is situated approximately 250 kilometres from Bloemfontein and 330 kilometres from Pretoria. The researchers are thus often dependent on the library for their information needs and article requests as confirmed by Burger (2007, p. 493):

> 'The ARC-Small Grain Institute is the only institute of its kind that offers one-stop small-grain information, not only to the commercial farmer, but also to new, emerging and small-scale farmers'.

1.4 SOUTH AFRICA AS A DEVELOPING COUNTRY: INTERNATIONAL AND NATIONAL TRENDS

1.4.1 International trends

Agriculture forms an integral part in any country's food production. Poverty and hunger go hand in hand and have been a reality since the earliest of days. This inspired the research of Dr Norman Borlaug in Mexico that resulted in the Green Revolution. He is recognised as the 'Father of the Green Revolution' for his research in increasing wheat production in Mexico, India, Pakistan and other countries (Milford & Runge 2007, p. 595). In 1970 Dr Borlaug received the Nobel Peace Prize, principally for his work done in India and Pakistan (Morrison 2013, pp. 2 of 4). Dr Borlaug visited South Africa during the

1970's to evaluate the national small grain research programmes. To improve cultivar programmes, he recommended that the programmes should be managed under one organisation, a decision which led to the establishment of Small Grain Centre in 1976 (De Villiers 2003b, p. 30). Dr Borlaug can thus rightfully be considered as the father of ARC-Small Grain Institute in Bethlehem (De Villiers 2003a, p. 28). Dr Borlaug passed away on 12 September 2009 at the age of 95 (Le Roux 2009, p. 14).

During an International Dialogue, which was held in Beijing, China in 2005, it was again stressed that growth in agriculture helps reducing poverty and ensuring food security. 'Agricultural growth plays a critical role in enhancing food security and reducing poverty in developing countries' (Agricultural and Rural Development in the 21st Century 2005, p. 4).

1.4.2 National trends: South Africa

The Department of Agriculture, Forestry and Fisheries (DAFF) in South Africa is striving to reduce poverty in South Africa and to increase food production (Bhaktawar & Burger 2011, p. 38). The South African agricultural sector can be divided into two sections, namely the commercial sector and a subsistence sector in the rural areas. Twelve per cent of the country can be used for crop production. The availability of water is the most restricting factor in South Africa's agriculture; currently almost 50% of South Africa's water is being used for agriculture (Bhaktawar & Burger 2011, p. 36). 'Primary commercial agriculture contributes about 3% to South Africa's gross domestic product (GDP) and about 7% to formal employment' (Bhaktawar & Burger 2011, p. 36).

The gross value of field crops contributes 27.1% to the total gross value of agricultural production (Bhaktawar & Burger 2011, p. 39). The gross income from field crops was R27 617 million in 2010 (Bhaktawar & Burger 2011, p. 39). Maize takes up the biggest part of field crops, followed by wheat and then sugar cane and sunflowers (Bhaktawar & Burger 2011, p. 40). Wheat is planted mostly in the Free State, Northern Cape and the Western Cape.

Training and research play an important role in South Africa's agriculture: '… scientists and researchers based at various organisations … are world leaders in their respective fields of agricultural research' (Bhaktawar & Burger 2011, p. 58). The ARC is the largest agricultural research organisation in South Africa and supports the research coordinated by DAFF (Bhaktawar & Burger 2011, p. 59). The ARC is committed to research, technology development and technology transfer. With these goals it contributes to the quality of life of the South African people (Burger 2007, p. 492).

1.5 DEMANDS AND CHALLENGES FACED BY LIBRARIES

Libraries are also referred to as 'library information services', 'information services' or 'information resource centres'. In this study the term 'library' will be used, because it is the term that is officially accepted at the ARC-SGI, the institution that will feature in this study.

Libraries worldwide are constantly confronted with new challenges and tendencies. The challenges mentioned in the following section all have a huge influence on libraries as well as the personnel. Only a few of the challenges are mentioned here (Akst 2005; Association of Southeastern Research Libraries [ASERL] 2001; Fourie 2004; Kuhlthau 2005; Lorenzen 2006; Mann 2001; Sharp 2001; Simmonds & Andaleeb 2001; Wilkinson & Harris 2002-2003).

1.5.1 Collection development and preservation

As a result of external factors, libraries face challenges with regard to their collection development and preservation. The following are some examples:

- There is a need for collection policies, where the decision must be made on whether libraries should go digital or regard digital material as supplementary to printed material;
- A vast amount of electronic resources (e-resources) is available. Libraries have to make choices according to budgets;
- There is a need to deal with the problems concerning the preservation of digital information; and
- Services to patrons, local and remote, have increased considerable with the Internet, as well as the available number of indexes, databases and abstracts.

1.5.2 Library patrons

Librarians need to a have good knowledge of their patrons to deliver an effective service. This can be accomplished by doing the following:

- Investigate the search methods and skills of patrons for possible changes in service delivery;
- Analyse patrons' knowledge of types of sources of information available; and
- Study patrons' information seeking behaviour.

1.5.3 Information resources

Access to resources is critical for researchers to perform in their research environment. The following are examples of the challenges that librarians have to deal with in the current changing environment:

- Need for developing new skills to stay in touch with information technologies and information management;
- Need for librarians to deal with a number of constraints, like declining budgets, and fewer staff members; and the
- Need for librarians to deal with new methods of document delivery.

1.5.4 Expectations and roles of librarians

It is important that librarians are willing to adapt to new technologies and to constantly grow through learning to ensure that there will always be a place for them. The following are examples of adjustments librarians have to deal with:

- The belief that the role of librarians and libraries are obsolete and becoming isolated due to the Internet and therefore a constant need to defend their roles in the new electronic environment;
- Librarians have to adapt to new working environments, for instance new methods as well as faster access to different forms of information, the lack of standardisation and technology that changes continuously;
- Adapting to the use of modern IT available, like electronic databases, Internet, OPAC's, Web 2.0 and Personal Digital Assistant;
- The need for librarians to deal with new role players, for instance IT personnel and other industries like the database industry and hardware companies;
- The perception by many (library patrons and general public) that all information on the Internet is available free of charge; and the
- Need to promote effective information skills and especially search methods of researchers and other role players in the agricultural sector.

More detail can be found in the following section.

1.6 BACKGROUND TO THE PROBLEM

The following paragraphs will deal in more detail with some of the previously mentioned issues to serve as a foundation for the study.

The role of libraries and librarians from the earliest of days has changed significantly to today's libraries and librarians. There has been a paradigm shift in how information is handled. Access to books changed to access to the information inside the book (Hale

1991, p. 340). This had a great effect on librarians as they have to deal with a new digital environment, while also maintain the role of a traditional librarian. Good working relationships with various other role players, like IT professionals, vendors and the database industry are now extremely important (Fourie 2004, p. 62).

With the emergence of the digital formats, librarians are faced with new challenges, but also with new concerns. Paper formats are still a valuable and reliable way of preserving information. A hundred years from now it should still be accessible. 'Print is a time-tested format that continues to fulfil promises that technology cannot yet deliver' (Wu 2005, p. 235). Both of these formats have their advantages and disadvantages and should be incorporated in the library's services.

Librarians need to adapt to new environments which include the development of the Internet and digital libraries, client relationships, information seeking behaviour, access to information and document delivery and services to remote patrons (Fourie 2004, p. 64). Libraries need to deliver information and services where the patrons are (Forsman 2012, p. 499). In the agricultural environment this is very important as researchers are not always in the same town as their library. Researchers sometimes do not have the time to visit the library and the electronic medium makes it easier to access needed material.

The changing environment of the research library should also be investigated. Hisle (2005, p. 170) talks about the 'information commons model of service', where academic libraries become the campus community centres. This model is an extension of the traditional library where students can seek the advice of the librarians, where they can work in groups or quietly by themselves and use the resources of the library.

Wu (2005, p. 234) states that patrons have shown a keen interest in the new technology, which, although it is not stable, will continue to go from strength to strength. Librarians cannot ignore this tendency just because it still has its weaknesses, they have to include this into their services and educate their patrons on its limitations as well as it strengths.

The Internet introduced a new manner in which the researcher can search for information. This seems to have changed their way of using a library. Previous studies have pointed out that students and researchers are willing to buy their own computers as an aid for their research (Oduwole 2004, p. 12). During 2001/2002 a study has been done at the University of Agriculture, Abeokuta, Nigeria on the access and use of the Internet, which showed that a growing number of students and scientists used the Internet (Oduwole 2004, pp. 12-15). It was used to enhance their research, as well as to serve as a communication tool with scientists outside Nigeria. The Internet must therefore be seen as an opportunity to improve services to patrons (Rao and Babu 2001, pp. 30-31).

This study proposes to confirm the role and position of librarians in the context of an agricultural information environment. New opportunities arise where patrons should be trained in accessing the Internet and locating the information they need. Guidance should be given in assisting the patrons to sift through the masses of information that is available on the Internet. 'IT has become the in-thing and university librarians must gear up and acquire the requisite skills which they can impart to users' (Oduwole 2004, p. 15).

With regard to the perception that all the information the researcher needs is available and free on the Internet, there could be a role for the librarian to guide them to reliable sources. Many of the Internet resources are not edited or checked for accuracy before and after publication (Wu 2005, p. 237). Librarians have the expertise and the competencies to make the correct choices. This experience should also ensure that the role of the research librarian would become more important than ever. The electronic media assists librarians to execute their work in a much easier and faster way, which complements their aim to satisfy the patrons' needs as quickly as possible.

Librarians are continuously faced with the notion that they are not needed because of the Internet. However, they believe that they add value and play a very important role in the information jungle, but still need to continuously prove themselves. The need for librarians to justify themselves is not a new idea. George, Stillwell and Warmkessel (2003, p. 76) described research that has been conducted in the 1990's by Bonnie Nardi and Vicky O'Day on the human nature of librarians and the designing of new software incorporating these qualities. As George, Stillwell and Warmkessel (2003, p. 76) put it: 'We hope to illustrate, through empirical findings, that librarian experts, using the tools of their trade, are an essential and irreplaceable agent within the realm of intellectual inquiry'.

Libraries in the agricultural sector experience the same problems as stated above. Singh (2004, p. 300) also highlights factors like digital collections, lack of funds and library automation. One of the problems that also occur in developing countries is the fact that new issues of journals sometimes only arrive after a few months, due to the fact that most of them are published in developed countries. Libraries can only subscribe to a few selected journals while there are thousands of titles available (Arunachalam 2002, pp. 1 of 7).

Libraries in the ARC can identify with problems and challenges as reported in the literature. Since the library can play an important role in the agricultural research that is being done in the ARC, it is worthwhile to address these challenges and sometimes frustrations in order to move forward in fulfilling the information needs of the researchers.

1.7 PROBLEM STATEMENT

As indicated in the preceding discussion, the environment in which libraries work has changed dramatically during the last three decades. Based on the literature research and preceding background the research problem can be formulated as follows:

- What should a service model look like that can direct the changing roles of libraries and librarians to be successful and effective in rendering services to researchers and other patrons in an agricultural research environment, with specific reference to the ARC-SGI?

1.7.1 Research questions

The following research questions have been identified:

1. What have been reported with regard to the services offered by agricultural information services in the context of developed as well as developing countries?
2. What are the needs and information seeking behavioural patterns of the researchers and other patrons of the library?
3. What competencies and skills do librarians need to effectively execute their role in such a research environment?
4. What should a model for an agricultural library in contemporary South Africa be like to keep track of international trends, changing patron needs and information seeking behaviour?
5. How can the changing role of librarians be incorporated in such a library?

1.8 OBJECTIVES OF THE STUDY

The aim of the study will be to investigate the functions and services currently rendered by the library of the ARC-SGI and to evaluate these against literature reports from similar institutions and the subject literature concerning information services in agricultural contexts. In addition, data will be collected with regard to the information needs and information seeking behaviour of the researchers and other patrons of the library in order to propose a model for an agricultural library in contemporary South Africa. Data will also be collected on services currently rendered. Based on the literature review, new roles and skills for the librarian will be mapped before proposing a service model for an agricultural library.

1.8.1 Proposed outcome of the study

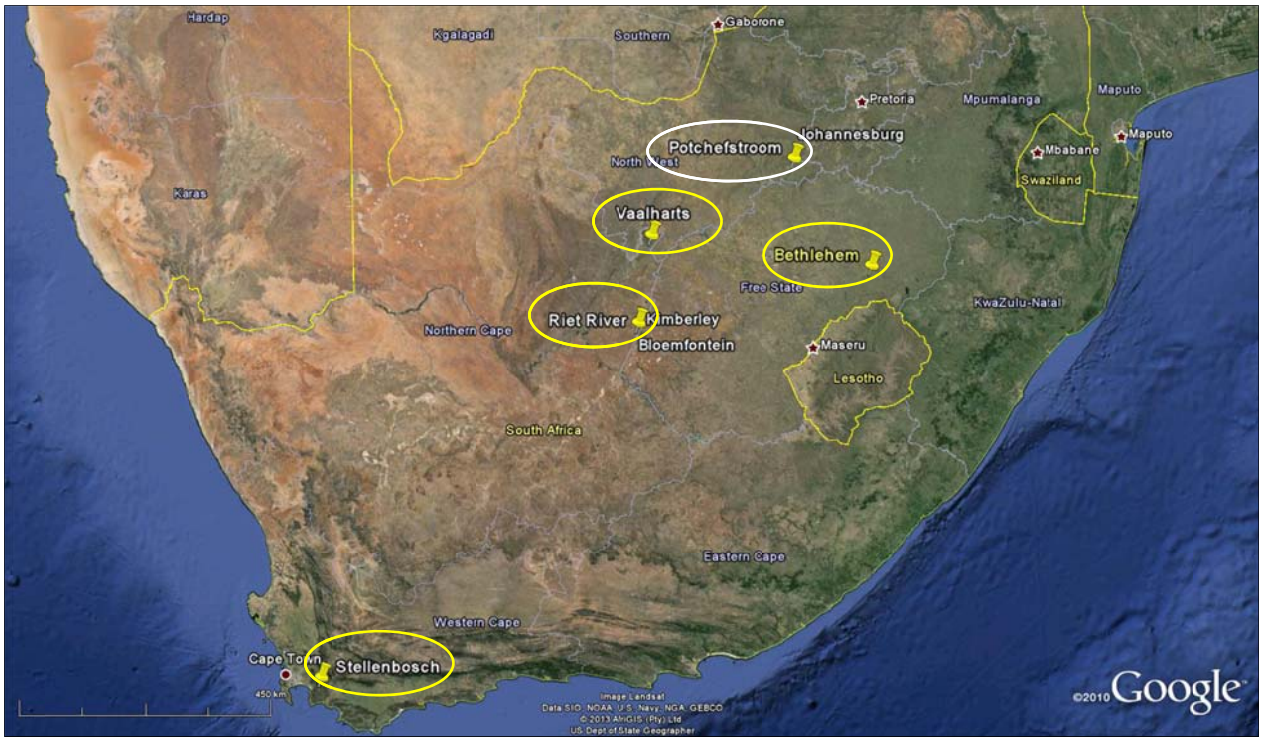
The study will focus specifically on the library of ARC-SGI. Very little has been found on research on agricultural libraries in the South African context. No project has been done on the library of ARC-SGI before this study. The findings of the project will be used to

develop a service model for a typical agricultural research library in South Africa as a developing country. It will include a critical view on services, current and new technologies, opportunities and competencies in comparison with international trends and reports, as well as recognition of patrons' information needs and information behaviour. The proposed outcome may serve as a guideline for all the libraries of the ARC, as well as other developing countries. It might also be of value to the international field of agricultural libraries.

1.9 DEMARCATION OF THE STUDY

This study will focus mainly on the library of the ARC-SGI in Bethlehem. The researchers and the other patrons of ARC-SGI's library are distributed among Bethlehem, Stellenbosch, Vaalharts and Riet River (both are Northern Cape agricultural research stations near Kimberley). The geographical distribution is displayed in Figure 1.4. The total number of personnel members at ARC-SGI is currently 133 (May 2013), who consists of the Research group and the Support group. The Research group includes researchers, research technicians and research assistants. The Support group includes artisans, farm personnel, labourers and administrative personnel. For the purpose of this study only the administrative personnel of the support personnel were included for the questionnaire. The management team of ARC-SGI includes researchers as well as support personnel. The Research group are the most regular patrons of the library, where the Support group uses the library on an irregular basis. Annually there are a number of students who work at ARC-SGI for a year getting some practical experience.

Figure 1.3: Geographical location of ARC-SGI library patrons



The personnel of ARC-SGI are divided into the following categories:

Research group:

- Researchers: 26
- Research technicians: 19
- Research assistants: 19
- General Manager: 1

Support group:

- Support staff (Administrative) 16
- Artisans 7
- Drivers 6
- Labourers 39

The management team of ARC-SGI consists of one General Manager, five researchers and three support staff members. They have been included in the totals above.

Investigation into the current services of the library and the information needs and information seeking behaviour of the researchers was done during 2010-2012. The personnel numbers continuously experience changes and the total number of personnel members were not the same at the time of the investigation as it currently is in May 2013.

1.10 CLARIFICATION OF CONCEPTS

Specific words or concepts are used throughout this study that needs clarification. It is necessary that the reader and the researcher attach the same meaning to them.

1.10.1 Agricultural librarianship

The following definition of agricultural librarianship has been noted by Adimorah (1977, p. 413):

> 'Agricultural librarianship can be broadly defined as the acquisition, processing and management of a special collection of books, journals, pamphlets, films on agriculture and cognate sciences and other materials needed to serve the needs of those engaged in agricultural practice and research and others who may need to utilize them'.

1.10.2 Agricultural library

Van Niekerk (1988, p. 212) defines an agricultural library as follows: 'Agricultural libraries may be defined as those libraries which collect, store and make available information relevant to agriculturists'.

According to Singh (2006, p. 521) agricultural libraries may sometimes be referred to as special libraries:

> '… libraries may be "special" on account of a specific subject (e.g. law, medicine and agriculture), form of collection (maps, pictures and digital documents), function (e.g. R&D related), institutional affiliation (e.g. government, business houses and hospital) and class of users (e.g. the blind, children and lawyers)'.

Agricultural libraries are very often connected to a parent organisation with research as one of the main purposes. It is therefore also appropriate to refer to agricultural libraries as research libraries or corporate libraries. Academic libraries at universities support the agricultural research done at the institution and may therefore also be linked to research libraries. The term 'academic' library also includes agricultural libraries as research is done in academic as well as research institutions (Kizilaslan 2006, p. 502).

1.10.3 Agricultural information

Watanapongse (1999, p. 48) offered the following definition for agricultural information: 'Agricultural information covers statistical data and factual reports on food production, natural resources management, biodiversity conservation, sustainable development and geographical information system'. Kizilaslan (2006, p. 498) stated that 'Agricultural information is also considered as an essential input to agricultural education, research and development and extension activities'.

1.10.4 Agricultural researcher/scientist

Research is described as the 'systematic investigation to establish facts or principles or to collect information on a subject' (Sinclair 1998, p. 1309). Agricultural research is done by a researcher or a scientist. Monu (1997) as well as Evenson and Kislev (1975) referred to both 'agricultural researcher' and 'agricultural scientist' in their articles. For the purpose of this study, the term 'patron' will also be used.

1.10.5 Information behaviour

The most appropriate definition found was the one of Wilson (2000, p. 49): 'Information behavior is the totality of human behavior in relation to sources and channels of information, including both active and passive information seeking, and information use'.

Information behaviour is described in more detail in Chapter 3 (section 3.2.3).

1.10.6 Information seeking behaviour

Wilson (2000, p. 49) described information seeking behaviour as follows: 'Information seeking behavior is the purposive seeking for information as a consequence of a need to

satisfy some goal'. Wilson (2000, p. 49) is of the opinion that information seeking behaviour, information searching behaviour and information use behaviour are subcategories of information behaviour.

Information seeking behaviour is described in more detail in Chapter 3 (section 3.2.4).

1.11 LITERATURE REVIEW

Agriculture plays a significant role in any country's economy (Burger 2007, p. 89; Shibanda 1991, p. 141). Gareth Thomas, the British Minister of International Development, underlined the importance of agriculture by saying 'No nation ever experienced economic growth and improved its people's prosperity without building a profitable agricultural sector first' ('SA agricultural sector: the bigger picture' 2007, p. 8). To support the development of agriculture, research and researchers are needed. According to Lumande (1991, p. 135) the importance of research in Zambia is recognised as the core of agricultural development. Researchers therefore need information and libraries for various purposes, for example the learning of new developments and solving problems (Arunachalam 2002; Dauphiné, Ochs & Joos 2003; Papin-Ramcharan & Dawe 2006). 'Without access to such information, researchers in many parts of the world may struggle for solutions to problems already addressed in published articles' (Dauphiné, Ochs & Joos 2003, p. 51).

Apart from books, journals and other printed material, information is available in numerous forms, including electronic media. This media makes it very easy for researchers to access information from their desktops without having to visit the library in person.

In the modern era of the Internet the question is sometimes asked whether there still is a purpose for libraries (Joint 2006, p. 12). This question has been asked for years, as a library historian, Patrick Williams once said that this problem '…is as old as American libraries' (Akst 2005, pp. 4 of 10). The feeling is that the importance of a library often needs to be emphasised, especially in the light that it is expensive to keep a library running (Papin-Ramcharan & Dawe 2006, p. 15). Researchers are dependent on access to up-to-date information in their respective fields to avoid duplication and other critical errors (Arunachalam 2002; Papin-Ramcharan & Dawe 2006). Therefore, they are dependent on libraries to provide in their respective needs (Van Niekerk 1988, p. 214).

In spite of all the information available on the Internet, Akst (2005, pp. 10 of 10) came to the conclusion that libraries still have a very important role to play in preserving our heritage as well as the digital knowledge that became available with the Internet. This argument is supported by Papin-Ramcharan and Dawe (2006, p. 15): 'Academic libraries have the role of obtaining access to and collecting and preserving material that can be used by both scholars and students'. Abels et al. (2003, pp. 2 of 17) emphasise the

importance of librarians, or information professionals, as they call them, due to amounts of information that are available and to the growth of the Internet. In ASERL (2001, pp. 9 of 12) the role and importance of the research librarian is stipulated.

> 'The research librarian of the future will have more opportunities to support learning, enhance teaching, and improve research, providing services to the users of today as well as anticipating the needs of the users of tomorrow'.

The dawn of the Internet should rather be seen as an opportunity for librarians to expand their services and not regard it as a threat to their careers (Melchionda 2007, pp. 125-131). Competencies and services should be polished to include electronic services and to use the Internet to their advantage. Librarians have to take a fresh look at the competencies and skills needed to execute their duties in the best possible way (Abels et al. 2003; Gosine-Boodoo 2006; Singh 2004). Roles are changing and electronic services open up a new field in every library (Margulies 2006; Pinfield 2001, pp. 33-34). New strategies, decisions and creativeness are needed in the digital world. The roles that the librarians play in their organisations are equally important (Margulies 2006; Oswitch 1990; Van Niekerk 1988).

As the multimedia makes it easier for the researcher to gain access to information, it is necessary for the librarian to investigate the information behaviour and information seeking behaviour of the researcher. Literature revealed that investigations into patron behaviour dates back to 1948 (Wilson 2000, p. 50). Courtright (2007, p. 273) and Pettigrew, Fidel and Bruce (2001, p. 43) acknowledge a shift in observing how patrons deal with information systems to the patrons themselves and how they search for information. James Krikelas developed the first model for the study of information seeking behaviour in 1983 (Weiler 2004, p. 46). According to Wang (2006, p. 610) patrons should be treated as customers. Patron behaviour is extremely important, as librarians need the information in order to adapt services accordingly to suit the researcher. Case (2006, p. 293) revealed that a tremendous amount of literature on information behaviour is available, which stresses the importance of knowledge of patron's information needs.

The ever-increasing costs of science journals make it difficult for libraries to afford many of the published works that their patrons need (Nowick & Jenda 2004, pp. 2 of 12). Libraries are facing problems like budget cuts due to financial constraints, which forces librarians to look for alternative methods to reduce costs (El-Sherbini 2007; Galvin 2004; Wang 2006).

This study will discuss new approaches and solutions mentioned in the literature in the field of information services. New technologies are being used to provide better services, such as blogs, wikis and instant messaging (Kajewski 2007, p. 420). Yiotis (2005, pp. 157-162) discusses the Open Access Initiative (OAI) where scientific information are available free of charge. These are only a few of the new technologies available; other

approaches also include developing new skills for the changing environment (Sharp 2001, p. 79); understanding of patrons' searching behaviour (Sadeh 2007, p. 309) as well as pursuing new roles for librarians (Fourie 2004, p. 67).

The literature shows that the information environment is as alive as it was in the earlier days and that it continuously presents challenges to librarians. Agricultural research is an on-going process and therefore it is imperative for agricultural librarians to keep track with new developments.

Chapters 2 and 3 will sketch a more detailed literature review on respectively library services and the information needs and information seeking behaviour of researchers. In Chapter 4 the skills and competencies of librarians will be highlighted as supported by the literature.

1.12 RESEARCH METHODOLOGY

A literature study will be done concerning information services in agricultural contexts covering national as well as international perspectives in developing, as well as developed countries. Existing services will be identified and analysed in terms of international standards. Investigations will be done into patrons' information seeking behaviour, as it is essential for the librarian to plan for the future. Competencies and skills of the librarians will also be indicated in order to improve services to the patrons.

The patrons of the library of ARC-SGI will be used as a case study. Both qualitative and quantitative research methods will be used, which will include a questionnaire as well as personal interviews with the patrons. Questionnaires will be the entry point, as some of the patrons are situated outside Bethlehem. The research will concentrate on the services of the library as well as patrons' information needs and behaviour. Interviews with 15 of the patrons in Bethlehem will be conducted. During interviews the participants will be able to explain in more detail the points made in the questionnaire. A literature study on the competencies and skills needed by librarians for their jobs will be conducted. The research methodology will be discussed in more detail in Chapter 5.

1.13 OUTLINE OF CHAPTERS

Chapter 1: Chapter 1 will cover the introduction and overview of the research project. This will include background information to the research problem, the purpose of the study, brief literature review as well as the research methods used.

Chapter 2: The services of ARC-Small Grain Institute library and the resources that are currently available will be discussed. Collaborations with other agricultural institutions and comparisons with other agricultural libraries will be reported. This will be evaluated against services and functions for agricultural library services as reported in the subject

literature (national as well as international). A global picture of library services will contribute to a more effective model for agricultural libraries.

Chapter 3: Information seeking behaviour and information needs in agricultural context will be discussed in Chapter 3. Researchers execute their searches according to their needs. This depends on whether they need information for research, planning or technology transfer. The importance of patron behaviour and search methods will be outlined as it is essential for future planning of the library.

Chapter 4: In Chapter 4 the literature study focusing on librarians will be discussed. Their skills and competencies will be investigated and reported.

Chapter 5: The research methodology will be discussed in detail in Chapter 5. Data collection, sampling techniques and data interpretation methods will be described. Both qualitative and quantitative methods are used in this study.

Chapter 6: In Chapter 6 the results of the empirical investigation will be described. The outcome of both the questionnaires and the interviews will be analysed and discussed.

Chapter 7: The proposed service model for an agricultural library will be presented in Chapter 7. The results of Chapters 2-4 and 6 will be used to develop a service model for an agricultural library.

Chapter 8: In Chapter 8 the study will be evaluated and conclusive remarks will be noted. Recommendations will be made for future purposes.

1.14 CONCLUSION

In Chapter 1 the background and general overview of the study were discussed. The demands and challenges faced by librarians were highlighted. Next, the problem statement and demarcation of the study were discussed. This was followed by a brief literature study and the outline of the chapters.

In Chapter 2 the services of ARC-Small Grain Institute will be discussed and compared to services of other national and international agricultural libraries.

CHAPTER 2

INFORMATION SERVICES IN AGRICULTURAL LIBRARIES WITH SPECIFIC REFERENCE TO ARC-SMALL GRAIN INSTITUTE LIBRARY

2.1 INTRODUCTION

In Chapter 1 a general overview and background was given to the changing role of agricultural libraries in South Africa and globally. The outline of the study was indicated and what was hoped to be achieved with this research.

In Chapter 2 an overview of practices and services in agricultural libraries will be given, as well as challenges faced by agricultural libraries. The services of the library of ARC-SGI in context with their Africa and international peers will also be discussed. According to Sahu (2007, p. 234) quality is the basic philosophy and requirement of library service and all libraries strive to deliver the best service possible. 'A quality service is one that fully meets the expectations and requirements of the users' (Sahu 2007, p. 234).

For the researcher it is therefore very important to deliver a quality service and through the knowledge gained from this study it is hoped to achieve just that.

2.2 IMPORTANCE OF LIBRARY SERVICES

The importance of agricultural information and research were described in Chapter 1, therefore the researcher will (apart from what is stated in this section) focus mainly on the role and services of agricultural libraries in Chapter 2. The library services at ARC-SGI, as well as what is reported in other countries, forms part of the first research question as stated in Chapter 1 (section 1.7.1). Library services connect closely with the information needs and information seeking behaviour (which will be discussed in Chapter 3) as both are regarded as important foundations for effective services to library patrons.

Researchers need information in all the stages of their research. Ellis and Haugan (1997) conducted a study into the information seeking patterns of engineers and research scientists. The investigation revealed that they (engineers and research scientists) needed information throughout their projects, which is in correspondence with the behavioural model consisting of eight categories, namely surveying, chaining, monitoring, browsing, distinguishing, filtering, extracting and ending (Ellis & Haugan 1997, p. 395). New projects are preceded by literature searches. Researchers need to know what has been published in their proposed field of research to avoid duplication and to ensure that they use published research findings to build their new projects on (Ekpenyong 2001, p. 119). Sraku-Lartey (2001, p. 246) stresses the fact that researchers need access to up-to-date information to produce research results of a high quality.

'Research is a building process; the work of others informs new work and new work builds on top of old' (Meyer 2006, pp. 3 of 6). Herman (2004, p. 39) states that researchers need information to gain an overview of existing knowledge on a given subject; to learn of new developments; to solve problems and for stimulation.

Research and information go hand in hand and therefore agricultural libraries are an essential aid in research support. Papin-Ramcharan and Dawe (2006, p. 15) acknowledge the fact that the library is an important link in an institution's research function. Agricultural research brings about new discoveries and technologies and this can be aided by access to information (Annoh 1999, p. 223). Typical projects that were running at the time of writing at ARC-SGI include diseases and pests of wheat and barley; soil cultivation projects, like no-till; herbicide resistance and cultivar breeding programmes of small grains in different regions of South Africa.

A short overview of agricultural libraries, internationally and nationally, is sketched in section 2.3.

2.3 AGRICULTURAL LIBRARIES

To stress the importance of agricultural libraries in the world, a few prominent libraries will be mentioned explaining their focus and purpose.

2.3.1 Agricultural libraries in Africa and internationally

Agricultural information in Africa is focused on increasing food production, agricultural exports, soil and water conservation and the reduction of poverty (Kizilaslan 2006, p. 497; Shibanda 1991, p. 141). Information to rural areas is spread through agricultural extension services to the farmers (Chifwepa 1997; Ekpenyong 2001; Shibanda 1991; Zhang 1991). Extension services are extremely important in Africa because they are often the direct link between the researcher and the farmer. 'It is essential that research and extension work together in a multidisciplinary effort to accomplish outreach to the farmer' (Harris 1990, p. 603).

Libraries are generally grouped in three different categories, namely those who resort under the government, the second group under research institutes and the third group under educational organisations, e.g. universities (Adimorah 1977; Kgosiemang 1999; Lumande 1991). In Thailand there are 120 agricultural libraries within the government as well as at academic institutions which houses information on Thai rice, silk, foods and lands (Watanapongse, 1999, p. 51). In China agricultural services are rendered at universities, schools as well as research institutes (Zhang 1991, p. 235). According to Zhang (1991, p. 236) the character or nature of agricultural libraries in China normally depends on the parent organisation. This is supported by Singh (2006, p. 522) by stating that the role of the special library depends on the nature of the parent organisation.

For many years the National Agricultural Library (NAL) in the USA, the Commonwealth Agricultural Bureau International (CABI) libraries as well as the agricultural holdings in the British Library in the United Kingdom (UK) and the Food and Agriculture Organization of the United Nations (FAO) library in Rome are regarded as very prominent agricultural libraries in the world (Jones 1990, pp. 513-514). The National Agricultural Library in Maryland near Washington, D.C. was established in 1962 and is the world's largest agricultural research library (Tirth, 1978, p. 38). CABI can be dated back to 1910 with entomology as one of its first research projects (CABI 2013, pp. 1 of 1). The British Library was brought into operation in 1973, but the institutions that were combined to form the library dated back many years, with the British Museum (founded in 1753) being the oldest (British Library 2012, pp. 1 of 5). The FAO library is called the David Lubin Memorial Library and was established in 1952 and is considered as one of the world's finest collections in food, agriculture and international development (FAO 2013, pp. 1 of 1).

2.3.2 Agricultural libraries in South Africa

In 1986 Van Niekerk (1986, pp. 134-135) divided agricultural libraries in South Africa into four categories. Firstly, the libraries which form part of agricultural schools, secondly, agricultural libraries at educational institutions like universities, technicons (today called Universities of Technologies) and colleges; thirdly, libraries attached to commercial firms; and lastly, state-owned or government agricultural libraries. The Central Agricultural Library under the Department of Agriculture is regarded as the most important of state-owned agricultural libraries. The library of ARC-SGI fell under the auspices of this library until 1992, when it officially became part of the ARC.

The history of agricultural libraries in South Africa was briefly discussed in Chapter 1 (section 1.2.2).

2.4. SERVICES AVAILABLE IN AGRICULTURAL RESEARCH LIBRARIES

In this section of the study the attention will be on services that are available in agricultural libraries. As the focus is mainly on the library of ARC-SGI, it will form the main point of entrance with reference to agricultural libraries in Africa and internationally. It is important to compare the services of ARC-SGI to other libraries to get an idea of how local services reflect against the rest of the world. To comply with the aim of the study to develop a service model for an agricultural study, it is necessary to identify any shortcomings before adjustments can be made.

2.4.1 ARC-SMALL GRAIN INSTITUTE (ARC-SGI)

The library at ARC-SGI was developed during the early 1970's with its main function being support to the researchers and the research activities of the Institute. Initially it consisted of in-house reports that were gradually extended with the procurement of

books. (HA Smit 2008, pers. comm. 8 May). The first official staff member to manage the library was appointed in 1978. In 1981 the first qualified person with a B.Bibl-degree, was appointed – namely the researcher. At first, the library was housed in one office with enlargements over the years. Today it occupies half of the upper floor of the Ernst Pieper Building of ARC-SGI in Bethlehem (See Figure 1.2 in Chapter 1). Although the library is considered a small library, the policy is to house a good collection of core books and journals. Baker (2008, p. 216) reflected as such: 'The value of library collections is about their appropriateness and relevance to the user, irrespective of how large or small they are: long may it remain so'.

The library stock consists of the following:

- Annual reports;
- Books;
- Books of cuttings;
- CD's and cassettes;
- Farmers' Day booklets;
- Journals;
- Maps;
- Minutes;
- Pamphlets;
- Progress / Project reports;
- Slides;
- Technology- and annual reports;
- Theses and dissertations; and
- Travel reports / Back to Office Reports (BTOR)

The books, theses and dissertations, journals and ARC-SGI reports are considered as the most important material in the library. At this point in time, March 2013, there are approximately 2700 books, 250 theses and dissertations and 3000 bound journal volumes in the library. The library also regards the project reports, the minutes of management meetings, books of cuttings and ARC-SGI booklets as part of their special collection. The books of cuttings consist of clippings gathered from newspapers and other publications and, in a visual way, reflect the history of ARC-SGI.

The databases that the ARC subscribed to at the beginning of the study – with access available to all the different institutes – were:

- CAB International;
- Sabinet; and
- SpringerLink.[1]

[1] After collecting empirical data, the ARC added CAB e-Books, BioOne, ISI Web of Science, Nature, OECD, Science and ScienceDirect to its subscribed E-content.

The ARC also holds a free subscription to Journal STORage (JSTOR) via their Developing Nations Access Initiative. ARC-SGI subscribes to certain journals in electronic format, namely 'Cereal Chemistry' and 'Cereal Foods World'. Other subscription titles that include the electronic version together with the paper copy include 'Plant Pathology', 'Annals of Applied Biology' and 'Crop Science'. The ARC-SGI also subscribes to one methods-manual in electronic format called 'Online American Association of Cereal Chemists AACC Methods'. Other information sources that are available to the patrons include databases such as Agricola and Scirus, the Internet and also open access sources such as J-Stage (Japan Science and Technology Information Aggregator, Electronic), SciELO (Scientific Electronic Library Online) and DOAJ (Directory of Open Access Journals).

Other agricultural libraries that house similar material, are that of CIMMYT (Centro Internacional de Mejoramiento de Maíz y Trigo = International Maize and Wheat Improvement Centre) in Mexico (CIMMYT 2013, pp. 1 of 1); ICRISAT (International Crops Research Institute for Semi-Arid Tropics) in India (ICRISAT serials acquisition 2013, pp. 1 of 1) and the University of Namibia in Namibia (University of Namibia 2013, pp. 1 of 2).

Information sources that have been mentioned in the literature include magazines, journals, databases, newspapers, research reports, patents, theses and dissertations, dictionaries, indexes, abstracts, books, yearbooks, Internet, search engines, libraries, OPACs, colleagues, encyclopedias, bibliographies and web pages (Nwagwu 2012; Shafi 2008; University of Virginia Tech 2013). This shows that the information sources that are available at the library of ARC-SGI compare favourably with other libraries in the world.

Services that are rendered at ARC-SGI show similarities to a typical university library, but on a much smaller scale (Kgosiemang 1999; North-West University 2013; University of Pretoria 2013; University of the Free State 2013). Similar to the North-West University as well as the Universities of Pretoria and Stellenbosch, ARC-SGI also offers services like library orientation, circulation of material, interlibrary loans, support with literature searches, photocopying of articles and current awareness services (North-West University 2013; University of Pretoria 2013; University of Stellenbosch 2013).

There is an additional computer with Internet access as well as two network points available in the library if a patron needs to connect his computer to the network. This computer is connected to a Hewlett-Packard (HP) scanner as well as a colour printer for the convenience of the staff members.

There are a few prominent differences which were observed from the websites of the mentioned universities. The universities have reserve sections where prescribed material is housed for course purposes, which is not applicable to ARC-SGI. Every researcher at ARC-SGI has access to Internet facilities on his own computer, which make it unnecessary to have computer workstations in the library as is essential at university

libraries. There is also no need for overnight facilities in the library at ARC-SGI, as the library is only open during official working hours of the Institute, namely from 07:45 till 16:15 from Mondays to Fridays. University libraries also offer learning management systems, such as E-learning, Blackboard and MarkWrite to students where they can download tutorials and class notes for their studies as well as to submit assignments in electronic format, which are not applicable to ARC-SGI, as we do not have a teaching function (North-West University 2013; University of Pretoria 2013; University of Stellenbosch 2013; University of the Free State 2013).

It must be taken into account that the library at ARC-SGI has only one staff member who is responsible for all the actions in the library.

2.5 DUTIES AND SERVICES AT ARC-SGI

Several international agricultural libraries have been contacted per electronic mail (e-mail) during 2008 in connection with their services to patrons. Enquiries were made on the services that they offer to their patrons in order to get a global picture of library services available. They include ICRISAT in India; Canadian Agriculture Library (CAL) in Canada; Department for Environment Food and Rural Affairs (DEFRA) in England; CIMMYT in Mexico and Escola Superior de Agricultura 'Luiz de Queiroz' (ESALQ) in Brazil. The NAL of the United States Department of Agriculture (USDA) is also a very important agricultural library. The researcher will refer to these libraries, amongst others, in the discussion of the duties and services of ARC-SGI library.

Duties and services for the library of ARC-SGI can be divided into the following categories depicted in Table 2.1:

Table 2.1: Summary of the duties and services
(This table was compiled according to the researcher's job description, role profile of the researcher as well as the ARC's Performance and Development Agreement (PDA) for librarians.)

DUTIES AND SERVICES		
Key functions	**Specific projects or activities**	**Actions**
Information and knowledge management	Information management includes the development, planning and execution of library information functions. Projects that are included in this section are information retrieval, document delivery, lending of material and Current Awareness Services	Actions involved are literature and other searches; interlibrary loans; document delivery; lending of library material; Table of Content services and alerts issued

Collection development and presentation	Development and maintenance of collection to ensure comprehensive subject and format coverage. Projects involved are acquisitions and maintenance; weeding and binding and cataloguing and classification	Actions involved are the acquisition of books, new journal issues, newspapers and other items; items prepared for shelving; stocktaking; items repaired or bound; items on a duplicate list; items catalogued and items added on OCLC/Worldcat
Client orientation and customer focus	Introducing new patrons to the library and staying in touch with information needs of all patrons. Projects involved are client/product communication; needs assessment and orientation and training	Actions involved are communication to patrons; compiling of client profiles and training sessions for patrons
Corporate, Institute and project participation	Identification, participation and execution of library projects on Institute level as well as within the ARC. Ensuring active involvement in committee work and maintaining agreements with partner institutions. Projects involved are compliance with Health and Safety regulations; organising of seminars; library and other committee meetings; ARC-LIS participation; ARC-SGI farmers' day; the library automation at Institute level as well as library services to researchers at ARC-GCI, Potchefstroom	Actions include the completion of items on safety requirement list; organising of scientific and popular seminars; library and other committee work; involvement in ARC-LIS activities; ARC-SGI farmers' day as well as library services in Potchefstroom
Financial management	Planning, compiling and motivation of budget; long-term financial planning in compliance with ARC policies. Projects include budget compilation; budget control and capital expenditure planning	Actions involved are the compiling and control of library budget as well as the timely planning of capital items
Human capacity development	Awareness of new opportunities for development and attending of professional courses and meetings. Projects involved are	Actions are courses and professional training; formal additional studies at a university; membership of professional

	self-development and professional status	bodies and library related seminars and meetings

In the next few paragraphs the services and duties will be discussed more extensively, with reference to the international arena as reported in the subject literature and noted through informal communication.

2.5.1 Information and knowledge management

The librarian is responsible for information management in the library, which includes the following functions:

2.5.1.1 Information retrieval

The library strives to ensure physical and electronic access to all types of material in its own collection as well as to remote resources. Access to subscription databases, such as CAB and SpringerLink will depend on the ARC's ability to subscribe. Detailed knowledge of information resources inside and outside the ARC is necessary to provide an efficient service to library patrons. Accessibility can be assured through good organising and cataloguing of material as well as effective control over circulation of material. At this point, the OPAC of the ARC libraries is only available to ARC patrons on the intranet of the ARC.

Researchers are assisted with literature searches when needed. Individual training is being given on how to use the databases available in order to help them to 'help themselves'. At the beginning of the study, the ARC subscribed to the databases CABI and SpringerLink[2]. CABI provides only bibliographic references, but SpringerLink provides full-text access to articles for the preceding ten years. Other databases, although we do not subscribe to them, which are popular with the researchers, are ScienceDirect[2] and Wiley Online Library. Free databases like Agricola and Scirus also provide good searching opportunities.

Although the ARC does not subscribe to ScienceDirect[2] and Wiley Online Library, the researchers are able to access these databases on a citation basis only, which is available free of charge on their websites. If they come across articles they need, it is referred to the library for interlibrary loans. Researchers, whom are officially registered at a university for study purposes, are able to access full text articles through their university's website.

It has been noted that researchers also use search engines, like Google, Dogpile and Google Scholar, for their information needs.

[2] After collecting empirical data, the ARC added CAB e-Books, BioOne, ISI Web of Science, Nature, OECD, Science and ScienceDirect to its subscribed E-content.

Literature searches play an important part of other agricultural libraries services as well. At ICRISAT library in India, literature searches are done by library personnel and consist of citations plus an abstract (if available) (V Venkatesan 2008, pers.comm. 17 September). Literature searches are also conducted by the Department of Agricultural Research Library in Botswana (Kgosiemang 1999, p. 88) as well as Argentina (L Martino 2008, pers. comm. 12 September); Ethiopia (Ethiopian Institute of Agricultural Research 2008) and Canada (K Petersen 2008, pers. comm. 29 September). At the Forestry Research Institute in Ghana (Sraku-Lartey 2001, p. 247) literature searches are conducted on the Internet as well as by consulting other international bibliographic databases, such as TREECD and 'Woods of the World'.

2.5.1.2 Document delivery

Document delivery includes the delivery of documents obtained through interlibrary loans as well as through other ways. Interlibrary loans are done for books and journal articles that are not available at ARC-SGI library. This is executed by using Sabinet's ReQuest system according to rules stipulated by the Southern African Interlending Scheme (SAIS), which is co-ordinated by the National Library of South Africa (NLSA) (National Library of South Africa 2013).

The ARC libraries have agreements with the University of Pretoria, the National Departments of Agriculture as well as with the Provincial Departments of Agriculture. This will be discussed later in this chapter (section 3.2.4.6).

International article requests are also being done when needed. Before an article is officially requested or bought directly from the publisher, there are a number of alternative steps tried, for example:

- Complimentary issues / Free online sample;
- Internet e.g. Google Scholar; and
- Directly from the author.

As mentioned in section 3.2.3.3, free trials are also communicated to the patrons, especially when it includes journals not readily available.

It appears as if interlending is a service that almost every library offers (CIMMYT Library 2013; FAO, David Lubin Memorial Library 2013; Forsman 2012; ICRISAT 2013; K Jackson 2008, pers. comm. 19 September; National Agricultural Library 2013; Papin-Ramcharan 2006; MRM Saad 2008, pers. comm. 18 September; University of Namibia 2013). Interlending services described for these institutions mostly include the interlending of books, technical reports, theses and journal articles.

Besides interlibrary loans, documents are also delivered to library patrons, which are obtained within the library of ARC-SGI. These requested documents may be a result of the distribution of the table of contents of journal issues or found on the Internet.

2.5.1.3 Lending of library material

All library material is available to ARC-SGI staff members for lending purposes. Currently, books and journals are lent out via paper issue cards, but the library is in the process to computerise the lending system. The Inmagic Genie system, which is used for the automation of the material, will be used for lending as well. According to Raubenheimer and Van Niekerk (2002, p. 17) interlending has a long history in South Africa as well as the rest of the world. They regard it as one of the most important resource sharing activities of librarians everywhere. Lending services are also available at the Animal Research Institute library (Annoh 1999, p. 225) as well as at the FAO (FAO 2013, pp. 1 of 1).

2.5.1.4 Current awareness service and alerts

To keep the researchers up to date on their fields of interest, the librarian registers for electronic mail (e-mail) alerts for the table of contents (TOC) of new journal issues. This is mailed to the patrons according to previously compiled distribution lists on the GroupWise e-mail system and/or the Imagic Genie system. Required articles are then photocopied upon request and placed in their mailboxes or pdf. copies are mailed to them electronically. Every staff member at ARC-SGI has a mailbox in an office in the administrative building where all the incoming mail is placed by staff members working in the Registry office. Journals that are actively used are, amongst others, ‘Journal of Cereal Science’, ‘Plant Breeding’, ‘Cereal Chemistry’ and ‘Crop Science’. Relevant articles are also sent to them as identified by the librarian. These articles could be paper copies, which are placed in their mailboxes, or electronic copies sent to the researchers via electronic mail. The librarian also registers at certain publishers, like AgBio Books and American Phytopathological Society (APS) Press to be alerted on new books published.

The circulation of new journals to long lists of researchers was ended in 1997. The reasons for this were because of difficulties retrieving the journals for binding purposes as well as rendering an effective service to other researchers in need of articles and interlibrary loans.

Alerts can be explained as when the librarian identifies an article and sends it to a researcher who might be interested in it, although he/she did not ask for it. This could only happen when the librarian has good knowledge of the patron’s projects and needs, which underlines the importance of knowledge of patrons’ information needs.

The efforts by the library to offer current awareness service is in line with the general assumption of the importance thereof as reflected in the literature. The library at ICRISAT in India, subscribes to Current Contents where patrons can either run their search profiles themselves, or the library can do that upon their request and e-mail the results to the patrons (ICRISAT current awareness services 2013, pp. 1 of 1). In London, UK at DEFRA, an alerting service is possible using Dialog, Factiva and ENDS Daily (K Jackson 2008, pers. comm. 19 September). At the Department of Agriculture and Agri-Food in Canada, CAL also uses Dialog and Factiva to keep their patrons up to date in their fields of interest (K Petersen 2008, pers. comm. 29 September). In 1999 it was reported that current awareness services are also provided at the Department of Agricultural Research Library in Botswana using CD-ROM products (Kgosiemang 1999, p. 88).

Current awareness service via the WWW is regarded as important in various disciplines, such as in the legal field (Rossouw & Fourie 2007), for oncology nurses (Fourie & Claasen-Veldsman 2007) as well as for teachers (Bitso 2011). According to Fourie (2006a, p. 69) librarians can stay alerted via:

- Formal recorded sources: journal articles, books, conference papers and information posted on websites;
- Formalised personal sources: discussion lists, weblogs, conference papers, workshops and training sessions; and
- Informal discussions with people: informal conversations at conferences.

2.5.2 Collection development and preservation

The researcher is also responsible for the development of the collection as well as the preservation thereof. This is executed through acquisitions, weeding and binding and cataloguing and classification. Binding and weeding are common practices which are done at other libraries as well (Smith 2009; Soma & Sjoberg 2010; Swart 2006). Ilesanmi (2013, p. 9) describes the preservation of library material using modern technology, such as digitisation and through dusted shelves, good ventilation and controlled temperature.

2.5.2.1 Acquisitions and maintenance

Possible new books are identified by the patrons and the librarian, submitted to the Library Committee and purchased according to funds available. The same procedure is followed for journals, after which they are ordered corporately through the Central Office in Pretoria according to the procurement policy and tender procedures of the ARC.

The librarian also maintains special collections, such as progress reports, cultivar evaluations and the books of cuttings. The latter are large, scrap-book type of books where all media reports of ARC-SGI are being kept. These media reports are cut from newspapers and magazines and pasted into the books of cuttings.

The National Agricultural Library in Beltsville, Maryland houses and maintains a few special collections, which include rare books, manuscripts collections and photographs (NAL special collections 2013, pp. 1 of 1). Lumande (1991, p. 138) reports on special collections in Zambia which consist of grey literature in the form of technical- and consultancy reports.

2.5.2.2 Weeding and binding

Binding of the journals are done annually for optimum preservation for the future. There are a few advantages and disadvantages in decisions on binding as discussed by Anderson (1999) and Frost and Woo (2007). The biggest advantage to binding is the preservation of the journal for many years to come. A practical disadvantage of binding is that the thick bound volumes make it difficult to photocopy articles.

Regular stocktaking is necessary to ensure control of library material and to solve problems (Zandberg & Isaacs 2006, p. 44). As books are lent out for indefinite periods, the librarian checks once a year if the books are still in the patrons' possession. Weeding is normally done before stocktaking to ensure that all redundant material is removed from the shelves (Swart 2006, p. 44). At the Concordia College in Minnesota they used a collaborative approach to weed unwanted items over a period of time (Soma & Sjoberg 2010). At ARC-SGI duplicate items and items received that do not reflect the purpose of the library, are put on a duplicate list and distributed first among other ARC libraries and thereafter to other libraries in South Africa.

With the gradual movement to e-journals libraries tend to review their binding practices (Frost & Woo 2007, p. 85). At the Hong Kong Baptist University Library an investigation was launched to review their binding policy and came to the conclusion to, amongst other outcomes, cease binding of journals where reliable and permanent online access exists, which could bring a substantial saving to the library (Frost & Woo 2007, p. 93).

2.5.2.3 Cataloguing and classification

New materials are processed according to prescribed rules and guidelines. Official library standards are used, including the Dewey Decimal Classification (DDC) system and the Anglo-American Cataloguing rules (AACRII). Books are added to Online Computer Library Center (OCLC) Connexion and finally added to ARC-SGI catalogue using the Inmagic Genie software, which is the official system used by the libraries of the ARC. Micrographic indexing is done to ensure maximum retrieval. This involves making analytical entries for selected books, e.g. proceedings and books with chapters written by individual authors. According to Ilesanmi (2013, p. 8) cataloguing and classification of library resources is an important function of librarians.

Cataloguing is a library practice, which is done in all libraries, to make their resources available to their patrons and outside clients. An example of a well-known catalogue is

AGRICOLA of the National Agricultural Library in Beltsville (National Agricultural Library 2013). Catalogued books are prepared for the shelves by adding spine labels, book issue cards and a plastic cover for protection.

2.5.3 Client orientation and customer focus

Client orientation and customer focus are, as the heading indicated, aimed at the library patrons and their needs. It is important to know the patrons to deliver a better service. At ARC-SGI this is done through client and product communication, needs assessment and orientation and training.

2.5.3.1 Communication on products to clients

Access to free trials of publishers is communicated to the patrons and where necessary, logins and passwords are obtained. Examples of such trials during the last five years include free, full-text access to journals available from Springer; Food Science and Technology Abstracts (FSTA), books from Books 24x7, ScienceDirect, BioOne and SAGE journals. New accessions and items of interest to the researchers are advertised through electronic mail and notice boards. Bitso (2011, p. 272) mentioned notice boards as one of the options to advertise, amongst other items, notifications from publishers and vendors.

2.5.3.2 Needs assessment

The librarian is responsible to develop and maintain the collection according to the needs of the patrons of the library. Regular information needs assessments are needed to determine the needs of the patrons; to identify gaps in the collection and to improve library services (Mi & Gilbert 2007, p. 31).

To stay in touch with the needs of the patrons, the librarian regularly talks to the researchers. Personal communication is easy as ARC-SGI is considered a small institute. The librarian attends the annual meetings where the researchers report back on current projects as well as research meetings where new projects are submitted. Some of these projects result in further academic studies at universities where the librarian is also involved in searches and interlibrary loans for such researchers. The librarian is also responsible for scientific seminars where researchers share their work experiences. Reading the researchers published articles assists the librarian to stay in touch with the projects that are currently running at ARC-SGI.

Researchers, technical and other staff members who are interested in formal studies, are supported by the ARC to do so. Further studies imply pre and post graduate studies (Honours, Masters or Doctoral studies) and diplomas in agriculture or administration at Universities of Technology. The researcher hopes to achieve an in-depth knowledge of the patrons' information needs and behaviour with this study to improve library services.

This is in line with a statement of Webb, Gannon-Leary and Bent (2007 p. 210) saying that it is very important to know your patrons to deliver first class service. Ekpenyong (2001, p. 120) stresses the importance of librarians' knowledge of their patrons and their research topics in order to assist them with their information needs.

2.5.3.3 Orientation and training

New clients are introduced to the services and functions of ARC-SGI library. Normal procedures, regarding lending of material, interlibrary loans, Inmagic Genie catalogue and databases are explained. Upon request, new patrons are assisted in using the available databases as well as the scanning facilities. In Brazil, at the Escola Superior de Agricultura 'Luiz de Queiroz' (ESALQ), patrons are assisted in using the information resources of the libraries, which includes catalogues, databases and the collection (MRM Saad 2008, pers. comm. 18 September). Patron education for undergraduate students is also done at the University of Namibia and attention is also given to postgraduate students (University of Namibia 2013, pp. 2 of 2).

2.5.4 Corporate, institute and project participation

The library of ARC-SGI is also involved in various library functions within ARC-SGI as well as the ARC. These functions include complying with health and safety regulations, participation in various committees, seminars, the annual farmers' day, the automation of the library, ARC-Library Information Services (ARC-LIS) as well as input in the partnerships with other institutions. The librarian also renders library services to the researchers of ARC-Grain Crops Institute (ARC-GCI) in Potchefstroom.

2.5.4.1 Health and safety compliance and library legislation

To ensure a safe environment for staff and patrons of the library, it is necessary to comply with safety regulations according to the Occupational Health and Safety Act. The library is equipped with Carbon Dioxide (CO_2) Fixed Gas Suppression System which releases gas in case a fire broke out. Water can cause irretrievable damage to books and other library material. The library has also direct access to a fire escape.

The librarian must keep herself informed of relevant legislation and standards, such as the Copyright Act (No 98 of 1978) and the Legal Deposit Act (No 54 of 1997).

2.5.4.2 ARC-SGI committees

The librarian is supported by a Library Committee, which is compiled by representatives of each section (Finance, Research and Development, Crop Protection, Germplasm Development, Plant Breeding, and Production Systems). The librarian acts as chairperson of the Library Committee. The Library Committee decides on various issues of importance of ARC-SGI, amongst others, to assist the librarian in problems that may

arise in the library, to approve the procurement of books and journals and to identify topics for seminars.

The librarian also serves on the Public Relations Committee where various activities are planned regarding ARC-SGI. The librarian occasionally renders assistance at the Farmer's Day Committee meetings by taking the minutes.

2.5.4.3 Seminars: scientific and popular

The librarian, together with the Library Committee, is responsible for organising the seminars held at ARC-SGI and acts as chairperson at local seminars. Several topics are considered when organising seminars, which include formal and popular seminars. Before speaking at a congress or a conference, researchers have to practice their presentations. This is done to ensure that there is no spelling or other mistakes, that their slides are clearly visible and that they stay within the time-limits. Researchers, who travel overseas, have to report back on what they have learned and what the impact is for ARC-SGI. Researchers can share new and exciting results of their research with the rest of ARC-SGI through seminars. Seminars are also organised for visitors to the institute who wish to do a presentation. Popular seminars entail hobbies and other interesting topics of the staff members, such as bird watching, medicinal plants, ground squirrels, astronomy and vacation trips to places such as Phuket, New Zealand and the USA. Refreshments are served at popular seminars.

2.5.4.4 ARC-SGI Farmers' Day

The librarian, as well as most staff members of ARC-SGI, is involved in the annual Farmers' Day, which is an important marketing event for ARC-SGI. Current topics that are important for the specific season are identified and according to Plan A (if it is not raining) the programme will take place outside in the fields. The researchers involved give presentations in the fields with the support of posters. Farmers are transported on wagons on a pre-defined route to see and hear what research is done at ARC-SGI. If it rains on that day, Plan B will proceed with PowerPoint presentations in the hall. Preparations include invitations, editing posters and presentations, refreshments as well as preparing the whole terrain for the day. The librarian is usually involved in editing the posters and presentations as well as assisting in organising breakfast. Presentations for the Farmers' Day are practised beforehand during a seminar.

2.5.4.5 Library automation project

The librarian is responsible for the effective functioning of the library automation system on institutional level using the Inmagic Genie system. Automation includes the cataloguing of all items in the library on this system. This ensures that the patrons can search the OPAC accessing it through the ARC's Intranet from their desktops.

2.5.4.6 ARC-LIS participation

All the libraries of the ARC work together on matters of mutual importance. This includes issues like subscriptions to databases and journals; the automation project on Inmagic Genie; training and general problems that affects all the libraries of the ARC. Training is organised as the need arise, for instance how to use OCLC Connexion, Sabinet and Inmagic Genie.

ARC-LIS has formed agreements with other institutions to secure free interlibrary services among them. These institutions include the University of Pretoria, the Provincial Departments of Agriculture as well as the National Departments of Agriculture. These agreements ensure the lending/borrowing of books and journal articles free of charge through interlibrary loan where electronic licences permits. With a letter of reference, researchers of the ARC are able to enter the library of the University of Pretoria and make use of their facilities.

2.5.4.7 Reporting

Reporting is executed by completing monthly statistics on the ARC's Intranet and annual statistics on interlibrary loans to the State Library. The Performance and Development Agreement and Evaluation (PDA & PDE) of the ARC can also be regarded as a method of reporting on library activities on a semi-annual basis.

2.5.5 Financial management

The librarian is responsible for the planning and compiling of the budget of the library. This also includes practical financial planning as well as continuous control and management of the budget at all times. All financial transactions are done in compliance with ARC policies and guidelines using the Progress financial system.

2.5.5.1 Compiling of annual library budget

The librarian compiles the budget using an Excel spread sheet. All the expense items are carefully worked out and distributed throughout the financial year where it is fitted best. This is done to assist the financial accountant to plan the budget for ARC-SGI. When the librarian is satisfied with the budget, it is imported into the financial system called ARC-Finances (ARC-FIN), previously known as Progress.

2.5.5.2 Budget control

Throughout the year the librarian controls the budget ensuring that expenses stay within the limits and that all activities budgeted for do take place.

2.5.5.3 Capital expenditure planning and execution

The librarian is also responsible to plan for all capital items needed in that financial year. This means that future planning is necessary to foresee what will be needed during the year. Capital items include items such as shelves, filing cabinets and desks.

2.5.6 Human capacity development

It is extremely important for library staff members to keep up with current events in their own field. This can be achieved through self development and professional status as explained in the following paragraphs.

2.5.6.1 Self-development

Self-development is an important aspect for the librarian of ARC-SGI. Personal skills are developed through training sessions, courses, congresses and meetings with other library organisations. It is also an advantage to enrol in further studies to support and promote their own education. The ARC offers excellent assistance in supporting further education. The need for regular training of librarians is also supported by Ilesanmi (2013, p. 11).

2.5.6.2 Professional status

The librarian has the opportunity to join professional associations, such as LIASA (Library and Information Association of South Africa) and SAOUG (Southern Africa Online User Group). These associations offer the opportunities to meet with other colleagues in the library field, organise training and congresses and participation in other general library issues.

2.6 CHALLENGES FACING AGRICULTURAL LIBRARIES

In spite of all the services that have been mentioned in the previous section, agricultural libraries, as other special libraries, are still facing a number of challenges. According to Muller (2007, p. 108), it is evident in the literature that libraries today are facing some of the same challenges as libraries in 1947. Walker (1993, p. 3 of 7) reported that prominent issues during 1948-1957 include:

> ‘the need for cooperation and for a source list of libraries and their special features; … convincing managers of the value of information, … properly trained librarians; the image of the special librarian …; the need for continuing education and for keeping abreast of developments in technology; …’.

Since 1947 the world has changed dramatically and more challenges have been added to the library profession (Muller 2007, p. 108).

Changes in library services are also described by Parihar and Pattnaik (2007, pp. 40-41). They concentrate mainly on changes to electronic services, including Web resources through library portals, digital photocopying to network printing, translation services from manual to automatic, library web-services, digital archives and reference help desks to 'Ask a librarian on-line'.

In South Africa, changes in library services are also gradually taking place. Agricultural libraries are following the same trend as other academic libraries and changes that are taking place in academic libraries also reflect in agricultural libraries. The most prominent change in libraries is the shift from traditional services to the digital form.

A few of the relevant changes will be discussed in this chapter.

2.6.1 Globalisation

Globalisation enables people to locate information and exchange ideas across national borders (Haugen 2005, p. 472). Ani, Atseye and Esin (2005, p. 194) describe globalisation as:

> '… the closer integration of countries or regions and peoples of the world and the breaking down of artificial barriers to the flow of information, knowledge, services and people across national boundaries'.

Basically, for researchers, globalisation means access to information and information resources regardless of their geographical location. Advantages of a globalised library system are stated by Ani, Atseye and Esin (2005, p. 194) as follows:

> '… access to quality and timely information anywhere, anytime in the country; access to local information through digitising of local content; preservation of information through electronic resources; reduction in cost of accessing information; reduction in risk of physical journeys to acquire and disseminate information; and increase in productivity'.

The Internet is fundamental in providing access to information and is, according to Frey (n.d., p. 6 of 8), together with the Global Positioning System (GPS) system, one of the two newest global systems available. Globalisation is one of the most important challenges for libraries, as it links the researchers to much needed information resources and for librarians it is a useful tool in library services. Haugen (2005, pp. 476-477) recorded a few examples where globalisation has an effect on library services, which include collections, technological tools, changing of library environment to become more informal, focus on information literacy skills as well as a change in the role of the librarian to adapt to new circumstances. Ani, Atseye and Esin (2005, p. 194) reported that some of the university and research libraries in Nigeria have registered with AGORA (Access to Global Online Research in Agriculture), which means that researchers from these institutions have online access to relevant information on the database. Globalisation in the library also comes with a price which leads to the next challenge.

2.6.2 Financial constraints

Financial constraints are not new to libraries. The literature reveals that many libraries, especially in Africa, are struggling with finances in order to keep their services on a good standard. Already in 1977, the Nigerian agricultural libraries faced the problem of books and journals whose prices and subscription are continuously rising (Adimorah 1977, p. 425). Financial constraints seem to be a universal problem to libraries (Chifwepa 1997; Harrell 2012; Hoskins & Stilwell 2010; Kgosiemang 1999; Nowick & Jenda 2004; Sraku-Lartey 2001). 'Today the libraries do not have enough money to purchase imported materials as we did before' (Watanapongse 1999, p. 51). According to Smith, as cited by (Kizilaslan 2006, p. 497), agricultural librarians have to support agriculture in an information environment that is becoming more and more complex with shrinking resources and expanding constraints. It has been found that in South Africa a few corporate libraries have been closed down by their organisations, due to the cost of libraries and the impression of free information available through the Internet (Muller 2007, p. 112). According to Laurence (2000, p. 1) it is possible for some library patrons to satisfy their information needs on the Internet, but '… for the purposes of academic research, such expectations are unrealistic and even dangerous'.

The amount of information available makes it virtually impossible to subscribe to all journals needed or to purchase all the books wanted. The costs of journals also contribute to the fact that libraries cannot afford all the titles they need (Nowick & Jenda 2004, p. 2 of 12). To overcome this problem, libraries team together to organise electronic deals with publishers for specific databases to access information – either for bibliographical references or full text articles. In South Africa, and worldwide, libraries co-operate as consortia to fulfil in this need of libraries (Csajbók, Szluka & Vasas 2012; Hoskins & Stilwell 2010; Thomas & Fourie 2006). Examples of databases involved in such deals include CAB Abstracts, SpringerLink and ScienceDirect. Access to these databases is extremely expensive and libraries cannot afford to subscribe to everything they need.

Journal subscriptions also rise every year and with the fluctuation of the currencies, it complicates the composition of an accurate library budget. This often leads to the cancellation of journal titles (Nowick & Jenda 2004, p. 1 of 12) and modest purchasing of books. Annoh (1999, p. 225) reported that only a few books and technical reports are acquired due to inadequate funding. According to a library budget survey done by 'Publishers Communication Group' (2012, p. 3) in North America, South America, Europe and the Asia Pacific Region, they forecasted a 0.5% increase in journal budgets, but a decrease of 0.1% in the budget for books. For 2013, the 'Publishers Communication Group' (2013, p.3) forecasted an increase of 0.3% in journal budgets, as well as an increase of 0.8% in the budget for books.

2.6.3 Digital revolution

The most prominent challenge we experience in the world of traditional librarianship is the advent of the Internet and the associated electronic environment. It has brought a total change in the attitude of librarians. In the past, librarians concentrated on collection building, cataloguing and rendering reference services. 'The "Great Libraries" of the nation had the largest collections and longest tails, small libraries had but shadow collections, and their patrons were left wanting' (Ross & Sennyey 2008, p. 149). Now, librarians need to focus on the patron and their information needs. (The information needs and information seeking behaviour of patrons will be discussed in Chapter 3.)

Electronic access to information has changed a number of services in the library. It has an impact on journal subscriptions, book formats, scholarly publishing, preservation of material and archiving. There is also a tendency among researchers and management to believe that all information is available free of charge on the Internet (Laurence 2000, p.1). The changes in the digital environment that have an effect on the library services for the purpose of this study will be discussed in short in the next sections: 2.6.3.1 to 2.6.3.3.

2.6.3.1 Impact on journal subscription

Journals have been available in print format since 1665 (Hunter 2007, p. 119). Electronic journals have been around since the early 1990's (McClamroch 2011, p. 41) and have grown in popularity ever since. According to Hunter (2007, p. 119) it is now the preferred method of access to journals and according to Wu (2005, p. 235) it is the notion to have both the print copy as well as access to the electronic edition. In a survey regarding journal subscriptions among the academic libraries of Indiana, it was found that electronic journals was the most preferred choice, but that they will always subscribe to a small core collection of printed titles in the libraries (McClamroch 2011, p. 51). Harrell (2012, pp. 9-10) reported on various studies published regarding electronic journals, which show that the electronic format was definitely gaining in popularity comparing to the printed format.

Realistically seen, it is not an easy decision for a library to suddenly convert all their printed journal subscriptions to online only. A number of factors need to be taken into account. A very important argument is that it is not necessarily cheaper to go online only. '… but they are also fraught with hazards and high costs. It is short sighted to view them as inexpensive "replacements" for all printed published articles, scholarly or otherwise' (Anderson 1999, p. 25). Taking the publishing and administrative costs into account, libraries can save about 10% in subscriptions (Hunter 2007, p. 121).

There are definite advantages and disadvantages to consider regarding electronic access to journals. Advantages are:

- It is easy to access for local as well as remote patrons;

- Journals are available much faster as one do not have to wait for mail delivery;
- Patrons can search the content via hyperlinks and search engines;
- Libraries save on physical space and shelving;
- Libraries also save time on administrative work as one does not receive or claim journals;
- There is no need to maintain a physical collection; and
- No need to bind the journals (Anderson 1999, p. 26).

Disadvantages include the following:

- The question of ownership: what do you get and for how long;
- Negotiations for access licenses can be costly and complex;
- There are no standards in the variety of electronic formats;
- Patrons need appropriate computers/hardware/software;
- The downloading of articles can be very slow;
- Copyright issues are more complex than with the paper copies; and
- The unexpected changing of the website addresses of the journals (Anderson 1999, p. 26).

Weighing the advantages and the disadvantages of the two formats, libraries have moved towards a focus on access, with growing interest in electronic access or a combination of print and electronic access (Mi & Gilbert 2007, pp. 46-47; Rhoe, Oboh & Shelton 2010, pp. 5 of 20).

2.6.3.2 Book formats

Books are still regarded as one of the more important mediums of information transfer (Carr 2007, p. 119). For hundreds of years it has been a stable format that is used for academic purposes or leisure. The traditional format is currently also subjected to the electronic environment. More and more books are published in electronic format to be read online. Mi and Gilbert (2007, p. 47) found in a study done at Providence Hospital in Michigan that a relatively high rate of respondents indicated that they either do not have a need for online books or they did not like reading online books. Chawner, Gordon and Walker (2005, p. 7 of 7) point out in their article that people regard reading in electronic format as less popular than reading a print copy. According to them readers tend to print anything that is more than one to two screens in length (Chawner, Gordon & Walker 2005, p. 7 of 7). Disadvantages include screen size and usage limitations (Harrell 2012, p. 11). Kim and Sin (2011, p. 181) found in their study at a public university that printed books are still frequently used by undergraduate students.

The electronic format of books are also gaining momentum, but not with the same speed

as the electronic journals. Carr (2007, p. 119) regards the printed book as one of the most common and convenient methods of communication:

> 'All of which enables us to say – even in the midst of the digital revolution – that the book has been an amazingly enduring and staggeringly effective piece of information technology'.

Harrell (2012, p. 11) came to the conclusion that e-books are gaining in popularity in spite of licencing and platform issues. Currently, e-books are not universally accepted as the best format for monographs (Harrell 2012, p. 11).

In South Africa, Zinn and Langdown (2011) did a survey via the LIASA mailing list on the use of e-books among academic librarians. The results showed that there was a gradual trend towards e-book adoption, but still a preference for a 'bit of both' (printed and electronic) (Zinn & Langdown 2011, p. 104). The problems they experienced with e-books are the cost of the equipment needed to read e-books, the cost of the e-books if the purchasing model is used and the reliability of the Internet (Zinn & Langdown 2011, p. 113). Sony was the first company to market an e-book reader, called Sony Librié in 2005 (Griffey 2010, p. 9). Amazon followed in 2007 with the Amazon Kindle (Griffey 2010, p. 10). These e-readers used electronic ink (e-ink) technology that makes it easier on the eyes and is using less power (Griffey, 2010, p. 7). A study done by Lai and Chang (2011, p. 573) showed that convenience, compatibility and media richness contributed to the acceptance of e-book readers.

2.6.3.3 Preservation of digital information and archiving

The preservation of digital material has been a global concern for research libraries since the early 1990's (Carr 2007, p. 186). Research libraries realised that a cooperative attempt on an international level was necessary to pilot a movement to create solutions for the problem, which was growing with the increasing amount of digital information (Carr 2007, p. 187). According to Mann (2001, p. 273) preserving digital content for the future is not a technical issue alone, but also has economic and political problems. Temporary solutions require bottomless funding to assure their own survivability. 'We cannot rely on digital formats to solve preservation problems when it is in the very nature of these formats to cause preservation problems in the first place' (Mann 2001, p. 273). This comment by Mann is very true, but the reality is that libraries today experience many problems regarding archival issues, for example, the lack of space as well as the format. Smith (2009, p. 25) reported that printed publications and microfilms were the preferred format for archival purposes at Adelphi University (New York), but today they are moving to the electronic format. The electronic format makes accessibility easier for the patrons and saves on shelving space. Budgetary factors also make it difficult to defend keeping both the print as well as the electronic format of journal back runs (Smith 2009, p. 25).

2.6.4 Open Access (OA)

Open Access (OA) is described by Suber (2007, p. 1) as literature that is digital, online, free of charge, and free of most copyright and licensing restrictions. According to Morrison (2006, p. 95) the Open Access movement strives to make scholarly, peer-reviewed journal articles available to everyone over the Internet free of charge. Martin (2010, p. 189) refers to Open Access as 'content that is peer-reviewed and shareable according to author licenses … or it refers to contracts the author signs with a publisher to retain certain rights'.

In the Open Access movement, authors willingly make their literature available to the world without getting paid for it and the Internet serves as the new technology. Suber (2007, p. 2) refers to the free literature as 'royalty-free' literature. Usually, the Open Access movement operates with the copyright holders' consent, which implies the unrestricted reading, downloading, copying, sharing, storing, printing, searching, linking and crawling of the full-text (Suber 2007, p. 2).

The main difference between Open Access journals and archives is that Open Access journals are peer-reviewed and with archives it is not necessarily the norm (Suber 2007, p. 4). The cost of Open Access journals is usually covered by subsidies, advertising, priced add-ons and auxiliary services (Suber 2007, p. 4). Copyright normally resides with the author.

Open Access archives comply with the Open Access Initiative (OAI), which means that a researcher can locate literature in an OAI-compliant archive, without any detailed knowledge of the archives (Suber 2007, p. 5). 'The Open Archives Initiative Protocol for Metadata Harvesting is a framework for automating harvesting of metadata from different applications' (Morrison 2006, p. 98).

Open Access do have a number of advantages. Researchers benefit the most from Open Access. They have access to more literature than their libraries can afford as well as faster access to information (Morrison 2006, p. 102). Institutional Repositories provides an easy way for them to share their work with other researchers' worldwide (Morrison 2006, p. 99). Researchers strive for professional gain and recognition and through Open Access publishing they provide access to their work to everyone (Yiotis 2005, p. 157). For researchers in developing countries Open Access is especially an outcome where their libraries cannot afford to subscribe to scholarly journals (Haider 2007, p. 451).

As the patrons are able to locate articles by themselves on Open Access, workload may decrease for library staff members in terms of interlibrary loans (Morrison 2006, p. 105). Libraries are also able to save on their serial subscriptions (Yiotis 2005, p. 158).

Martin (2010, p. 190) explained that Open Access content is sometimes difficult to find due to the fact that not enough metadata has been added to library catalogues and databases. She indicated that although more Open Access content are continuously accessible through online directories, there still are content available in personal Web sites and digital repositories that are not indexed (Martin 2010, p. 190). Cummings (2013) conducted a study investigating the indexing of Open Access scholarly journals by three aggregation databases (Ebscohost Academic Search Complete, Gale Onefile and Proquest 5000 International) and the inclusion of these in Journal Citation Reports (JCR). He found that still very small percentages of open access journals were indexed, but it represents an average annual percentage increase of 43.4 per cent over the past seven years (Cummings 2013, p. 173).

Examples of Open Access publishing are the Directory of Open Access Journals (DOAJ), which is maintained by Lund University Libraries in Sweden and Hindawi Publishing Corporation (Martin 2010, pp. 190-191). OAIster is a union catalogue hosted by the University of Michigan that harvests metadata (Norris, Oppenheim & Rowland 2008, p. 710). It is also accessible through OCLC's WorldCat as it indexes records from OAIster (Martin 2010, p. 192). Google Scholar and Google are also reckoned as important sources of Open Access articles (Norris, Oppenheim & Rowland 2008, p. 714). The University of Pretoria shows a list of Open Access sources on the library's homepage (University of Pretoria 2013).

Open Access resources could play an important role in any library to enhance the services the library offers to its patrons. It will therefore be worthwhile to further investigate Open Access sources that could be used by the researchers, especially agricultural researchers.

2.6.5 Training of librarians

According to Muller (2007, p. 109) South Africa encounters a shortage of young persons who are interested in Library Science. The reason is partly because of the past image of librarians and partly because some organisations appoint non-library professionals to handle their information resources. Lynch (2002 cited in Muller 2007, pp. 108-109) stated that in the USA a great number of qualified librarians – with Master's Degrees – retired in 2009 and apparently South Africa was experiencing the same situation (Muller 2007, p. 109). The ageing and retirement of the librarian workforce is also discussed by Edge and Green (2011) as well as Matarazzo and Mika (2006).

Special libraries need to address the shortage of qualified leaders by educating and training junior personnel members and to provide opportunities for development (Muller 2007, p. 109).

2.6.6 Marketing of the value of special libraries and librarians

Like other librarians of special libraries, agricultural librarians need to promote themselves to their organisations as well as their patrons. Marketing in libraries is not a new concept and according to Gupta (2006, p. 7) dates back to the 1870's, but according to Nawe (2006, p. 93) the libraries in Africa only seriously started with marketing in the 1970's. Librarians still feel uncomfortable to market themselves and would rather concentrate on their services (Muller 2007, p. 113). According to Singh (2006, p. 527) the idea of marketing in Indian libraries is relatively new, but the value thereof is very important. He stated that products and services are not fully used because it is not marketed well enough. In terms of this study, Schachter (2008, p. 44) says it very clearly: 'Marketing is basically about identifying customer needs and then meeting those needs'.

Various articles have been published regarding the marketing of libraries, such as Aharony (2009); Gupta (2006); Gupta and Jambhekar (2002); Rowe and Britz (2009) and Singh (2009). Aharony (2009) conducted a study to explore the attitudes of school, academic and public librarians towards marketing libraries. Gupta (2006) explains the concept of marketing, including the 'marketing mix', which is the four P's of marketing – product, price, place and promotion. Gupta and Jambhekar (2002) developed a customer-focused approach to market library and information services. Rowe and Britz (2009) stressed the importance of strategic planning and that marketing should be an essential part of planning. They developed a marketing plan for library services. Singh (2009) conducted a study to determine if there is a connection between the attitudes of academic librarians and their marketing behaviour.

The literature consulted all supported the importance of marketing, and this might be a good subject for future investigation.

2.6.7 Information technology (IT)

Developments in new IT available to libraries seem to have a positive impact on library services and should be implemented to our advantage (Chisenga 2006, p. 5). According to Chisenga (2006, p. 5) and Singh and Kumar (2012, p. 206) new IT tools provide electronic access for patrons to a number of services, for instance:

- Online Public Access Catalogues (OPAC's);
- Digital information resources;
- Interlibrary loans and document delivery;
- Resource sharing;
- Patron education and reference services; and
- Provision of facilities for accessing information.

Librarians need to stay on top of the latest technologies available to ensure effective services to their patrons.

2.6.8 Information literacy

Information literacy is defined by the American Library Association (ALA) as '… a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information' (Association of College and Research Libraries 2000, p. 2). For the science and engineering/technology disciplines, the definition is adapted by the ALA/ACRL/STS Task Force on Information Literacy for Science and Technology (2006, p. 634):

> '… as a set of abilities to identify the need for information, procure the information, evaluate the information and subsequently revise the strategy for obtaining the information, to use the information and to use it in an ethical and legal manner, and to engage in lifelong learning'.

According to Bawden and Robinson (2002, p. 297) the literature also refer to other related terms used, such as computer literacy; library literacy; media literacy; network literacy; digital literacy; as well as informacy. Hepworth (1999, pp. 2-3 of 13) argued that it is expected of a student who is information literate and who has information skills to be able to:

- Recognise that accurate and complete information is the basis for intelligent decision making;
- Determine exactly what problem they are trying to resolve;
- Determine what information is required for the task;
- Formulate questions that help to define what content is required;
- Identify potentially relevant sources of information;
- Develop successful search strategies;
- Gather information through experiment or secondary sources;
- Organise and store information;
- Interpret, analyse and evaluate the validity of collected information;
- Develop insights, judgements and predictions;
- Use effective and appropriate tools and methods for the presentation of data and findings;
- Develop strategies and techniques for the publishing of results and reports; and
- Adapt these cognitive and behavioural information strategies to different situations and contexts.

Australia and New Zealand identified six core standards that underpin information literacy acquisition, understanding and application by individuals (Bundy 2004, p. 11). These standards states that an information literate person:

1. Can recognise the need for information and determine the nature and extent of the information needed;
2. Finds needed information effectively and efficiently;
3. Critically evaluates information and the information seeking process;

4. Manages information collected or generated;
5. Applies prior and new information to construct new concepts or create new understandings: and
6. Uses information with understanding and acknowledges cultural, ethical, economic, legal, and social issues surrounding the use of information (Bundy 2004, p. 11).

The ALA/ACRL/STS Task Force on Information Literacy for Science and Technology developed five standards and twenty-five performance indicators for science and engineering/technology (ALA/ACRL/STS Task Force … 2006, p. 634). The five standards state that the information literate student:

- Determines the nature and extent of the information needed;
- Acquires needed information effectively and efficiently;
- Critically evaluates the procured information and its sources, and as a result, decides whether or not to modify the initial query and/or seek additional sources and whether to develop a new research process;
- Understands the economic, ethical, legal, and social issues surrounding the use of information and its technologies and either as an individual or as a member of a group, uses information effectively, ethically, and legally to accomplish a specific purpose; and
- Understands that information literacy is an on-going process and an important component of lifelong learning and recognises the need to keep current regarding new developments in his field (ALA/ACRL/STS Task Force … 2006, pp. 635-641).

Librarians have a responsibility to assure that their patrons are able to help themselves when searching for information. Even the generation with tertiary qualifications is sometimes not naturally information literate (Bent, Gannon-Leary & Webb 2007, p. 91; Muller 2007, p. 118). Du Bruyn, Fourie and Bothma (2013) discuss the importance of an advanced information literacy programme focused on postgraduate researchers. The digital environment has thus brought extra responsibilities to library staff members in the sense that they need to train the patrons in utilising the resources available to them. Information literacy is such an important aspect for library patrons that it is a subject that should be investigated further.

2.6.9 Co-operative networking

Changes in the world of information provision have forced libraries to seek for alternative ways to maintain and upgrade their standards of service delivery. The ever increasing amount of information available and costs that are ever rising, make it extremely difficult for libraries to keep up, especially libraries with shrinking budgets (Adimorah 1977; Ekpenyong 2001; Ojedokun & Lumande 2005).

Ekpenyong (2001, p. 119) expressed the necessity of co-operating between libraries in Nigeria, and stated that co-operation should include the acquisition of books and journals; resource sharing; the preservation of research materials; interlibrary loans; cataloguing and sharing their expertise in reference questions from patrons. IT brought new opportunities for resource sharing where in the past it was mostly limited to interlibrary loans (Singh & Kumar 2012, p. 206).

Today information is regarded as a commodity, which can be bought and sold (Ojedokun & Lumande 2005, p. 66). Libraries now do not have the exclusive right to information provision, and this function is taken over by businesses that are profit orientated (Ojedokun & Lumande 2005, p. 66).

Two examples of collaboration in disseminating agricultural information are AGORA (Access to Global Online Information in Agriculture) and AGLINET (AGricultural Libraries Information NETwork) (Wu & Ochs 2007, p. 55). Singh and Kumar (2012) reported on the success of the Consortium for e-Resources in Agriculture (CeRA) in India. In South Africa there are five regional academic library consortia, namely Gauteng and Environs Library Consortium (GAELIC), Free State Libraries and Information Consortium (FRELICO), Cape Libraries Cooperatives (CALICO), Eastern Seaboard Association Libraries (ESAL) and South Eastern Academic Libraries' System (SEALS) (Ojedokun & Lumande 2005, p. 68).

2.6.10 Embedded librarianship

Librarians realise that in a changing world of digital information it is no longer necessary for patrons to physically come to a library and they need to find opportunities to change traditional library services into something that is more rewarding and valuable for their organisations (Shumaker 2012, p. 3). Embedded librarianship creates the opportunity for the librarian to work closely with a group of people who needs the expertise of the librarian. Shumaker and Talley (2009, p. 9) define embedded librarianship as follows:

> '… it involves focusing on the needs of one or more specific groups, building relationships with these groups, developing a deep understanding of their work, and providing information services that are highly customized and targeted to their greatest needs'.

Embedded librarians form a partnership with the group and develop strong connections and relationships with the rest of the team (Carlson & Kneale 2011, p. 167). It differs from traditional reference work in the sense that the embedded librarian needs a good understanding of the project under way, which enables the librarian to customise contributions according to the project and deliver valuable, on-going information services (Shumaker 2012, p. 5). As part of the team, the embedded librarian takes the same responsibility for the project as the rest of the team.

Shumaker (2012, pp. 12-14) identifies five advantages of embedded librarianship versus traditional services as displayed in Table 2.2 below:

Table 2.2: Advantages of embedded librarianship

TRADITIONAL REFERENCE LIBRARIAN	EMBEDDED LIBRARIAN
Librarian is responsive – wait for questions	Librarian anticipate – don't wait to be asked
Individual customers - help patrons one at a time	Work as part of a team
Standardised services	Customised services
Single service transactions	On-going projects
Deliver services only	Partnership orientation

According to Carlson and Kneale (2011, p. 170) embedded librarianship is a powerful way to show what librarians can do beyond traditional functions and why they are now needed more than ever. As the research is done at ARC-SGI in terms of specific projects, embedded librarianship might proof to be a valuable way to assist and become more involved in projects. It would therefore be valuable to investigate embedded librarianship in more detail in the future.

To give a concise overview of the challenges facing agricultural libraries, it is summarised in the Table 2.3:

Table 2.3: Summary of the challenges facing libraries

CHALLENGES	DESCRIPTION
Globalisation	Access to information and information resources regardless of their geographical location
Financial constraints	Access to information becomes more expensive each year, which complicates libraries' task to subscribe and purchase all that is necessary to their patrons
Digital revolution	The digital revolution resulting from the Internet has an impact on several activities of the library. This includes subscriptions to journals, book formats, preservation of material and archiving of electronic content

Open Access	Open Access influences the way authors choose to publish their articles and could have a positive impact on libraries' budgets
Appropriately trained librarians	It appears that there is a shortage of qualified young people in the library environment and senior librarians need to train and educate them for the future
Marketing the value of special libraries and librarians	Librarians need to market themselves and emphasise their services more effectively to their organisations
Information technology	Librarians need to stay informed of new technological developments in their field to ensure effective services to the patrons
Information literacy	Library patrons are not always as information literate as generally assumed and it is therefore the responsibility of the librarian to train them
Co-operative networking	The ever increasing cost of information forces libraries to find alternative ways to stay current. Co-operative networking provides a solution to assist when negotiating for quality deals with publishers
Embedded librarianship	Embedded librarianship is a valuable way to become deeply involved in research projects of an organisation and to become part of the research team

The literature consulted revealed certain services that are not currently part of ARC-SGI's services, but are worthwhile to pursue in the future. They are discussed in the next section.

2.7 SERVICES CURRENTLY NOT AVAILABLE AT ARC-SGI

The following services are not currently part of ARC-SGI, but might add value to the library's service.

- **'Ask a librarian online' service:** A feature that appeared on some of the other libraries' websites is a 'question and answering service' (Parihar & Pattnaik 2007, p. 41). A service of this kind can play an important role to researchers in terms of quick answers to their questions or even requests that needs longer time. To the library of the ARC-SGI, this can be a valuable addition to services rendered.

- **Extension of current awareness system**: A service that the library at ARC-SGI not currently renders is a Current Awareness Service using a specific database, like Current Contents, Dialog, Factiva, etc. Current Contents, as implemented by ICRISAT, can be utilised in setting up profiles and run them once a week, or whichever option is chosen. References are sent directly to the researcher via e-

mail. DEFRA uses Dialog, Factiva and ENDS on a daily basis (K Jackson 2008, pers. comm. 19 September).

- **Formal exchange agreements:** Currently, the ARC-SGI library does not have formal exchange agreements with other organisations. The library does receive annual reports from Rothamstead Research in Harpenden, Scottish Crop Research Institute in Invergowrie, Scotland and from CIMMYT in Mexico. These can be regarded as courtesy copies and no formal exchange agreements have been tabled. Exchange programmes are quite common practice in libraries worldwide (Kgosiemang 1999, p. 85; Zhang 1991, p. 243).

- **Support with referencing techniques:** Referencing standards for theses and dissertations differ from university to university and remain a constant problem to researchers. Guidelines on the ARC-LIS website as well as technical assistance can help them tremendously in completing this part of their theses.

2.8 CONCLUSION

This chapter started with an overview of agricultural libraries and then concentrated on the services currently available at ARC-SGI. Reference is made to what is being done in libraries in Africa and the rest of the world. Challenges facing the library are discussed which are summarised at the end.

In Chapter 4 the competencies and skills needed by librarians to fulfil the above duties and responsibilities will be discussed.

In the next chapter, Chapter 3, the information needs and information seeking behaviour of the agricultural researcher will be discussed.

CHAPTER 3

INFORMATION SEEKING BEHAVIOUR AND INFORMATION NEEDS REGARDING AGRICULTURAL RESEARCHERS

3.1 INTRODUCTION

Chapter 3 will cover the second research question as stated in Chapter 1, namely information seeking behaviour and information needs in agricultural context. This connects closely to the library services, which are discussed in Chapter 2. To render a quality service to the patrons, it is important to gain in-depth knowledge about their needs and behaviour (Malliari & Kyriaki-Manessi 2007; Singh & Satija 2008). Librarians need to understand what their patrons want in order to plan effectively and to address any obstacles they encounter when using library resources (Fidzani 1998; Kuruppu & Gruber 2006). To deliver a service to suit the patrons' needs, it is important to know more about them (Singh & Satija 2006, p. 29). Hepworth (2004) developed a conceptual framework as a guide for analysing and organising data that is useful to understand the information needs of a specific community. As Hepworth (2007, p. 53) puts it:

> "… we need to understand the phenomena in society i.e. cultural, environmental and social factors as well as individual factors that are linked to how people learn, their IB [Information Behaviour] and satisfying their information needs so that we can continue to develop successful information products and services".

Modern technology has a great impact on information seeking behaviour (Patitungkho & Deshpande 2005, p. 4). Today, there are vast amounts of information available through both printed and electronic means, which places a further responsibility on librarians. They should be able to guide and educate their patrons and this is only possible if they know what their needs are. It is therefore necessary to be more knowledgeable on patrons and their information seeking behaviour, including their information needs. Webb, Gannon-Leary and Bent (2007, p. 210) stress the fact that it is crucial to know your patrons in order to deliver very good support to them.

This chapter reports on a literature study on information needs and information seeking behaviour in agricultural contexts, which will at a later stage be used to contribute to suggestions on a model for an agricultural library. Important issues that will be discussed include the clarification on the concepts and the literature review regarding information seeking behaviour. Other aspects that will also be discussed

are library information services and sources; the preferred format of information as well as information literacy.

3.2 CLARIFICATION OF CONCEPTS

For the purpose of this study, it is important to explain certain concepts to clarify what is meant by the different concepts as found in the literature. The concepts that are discussed in more detail are information needs, information seeking, information behaviour and information seeking behaviour, as well as why the term, information seeking behaviour, is accepted for this study.

3.2.1 Information needs

Case (2007, pp. 72-75) discusses how four scholars, namely Robert Taylor, Nicholas Belkin, Carol Kuhlthau and Brenda Dervin, have described 'information needs'. **Robert Taylor** focused on how and why patrons asked questions at a reference desk in a library (Case 2007, p. 72). Taylor (1968, p. 182) identifies four levels of information needs of which the first level is a conscious or unconscious need for information. He calls this unexpressed need the visceral need. The second level is where the person reaches the conscious stage and the need is sometimes communicated to somebody else with the hope that the vagueness will disappear. During the third level, a formalised statement is made and he can describe his area of doubts in concrete terms (Taylor 1968, p. 182). The last level is called 'compromised need' where the question is presented to the information system. A compromise is made between the original query and what it should look like to retrieve the correct answer from the system (Belkin 2005, p. 45; Case 2007, p. 72). **Nicholas Belkin's** theory reminds of Taylor's first level of visceral need (Case 2007, p. 74). According to Belkin, the basic motivator of information seeking is an 'anomalous state of knowledge' (ASK). ASK can be explained as that a person recognises that there is an anomaly in his/her knowledge on a topic (Belkin 1978, p. 81; Belkin, Oddy & Brooks 1982, p. 62). This ASK is converted into a communicable structure, for instance, a request, to try to resolve the state of anomaly. If it was successful, the system is closed, but if it is not, the system is reinstated with a new ASK (Belkin 1978, p. 81).

Carol Kuhlthau argues that uncertainty is the beginning stage of a search, which is accompanied by feelings of anxiety (Case 2007, p. 74). 'Uncertainty and anxiety are an integral part of the process, particularly in the beginning stages' (Kuhlthau 1991, p. 361). She describes six stages of the information search process, starting with 'initiation', which is accompanied by feelings of uncertainty and frustration and ends with 'presentation', where feelings of relief and satisfaction are present (Kuhlthau 1991, p. 368; Kuhlthau 1993, pp. 343-344). **Brenda Dervin** explains 'information

needs' through her 'sense-making' theory (Case 2007, p. 75). She states that the individual needs to make sense of his/her world in his or her own time and place (Dervin 1983, p. 170). Individuals constantly have questions that need to be answered; these questions are the 'information needs' that they experience. She defines 'information need' starting with 'need' that is a state within a person that reveals a gap that requires filling. When 'need' is applied to information, the gap that is previously recognised, can be filled by something the person calls 'information' (Dervin 1983, p. 156). Shortly, an individual experience a gap in a particular time and place, constructs a strategy for that moment and implements the strategy with specific tactics (Dervin 1992, p. 82).

According to Singh and Satija (2006, p. 27), 'information need is a factual situation in which there exists an inseparable interconnection with "information and need"'. A need exists and therefore information is generated. Wilson (1981, p. 3) was of the opinion that there was much confusion concerning 'information needs' in user studies. He explained the complexity of the term 'information' and the numerous uses connected to the word. Part of the confusion is attributed to the lack of a proper definition for 'information need' (Wilson 1981, p. 3). The association between 'information' and 'need' further confuses the situation, because 'needs', in the 'human needs' association, are divided in three categories, namely physiological, emotional and cognitive needs (Wilson 1981, p. 7). This contributed to Wilson's remark: 'Indeed, it may be advisable to remove the term "information needs" from our professional vocabulary and to speak instead of information-seeking towards the satisfaction of needs' (Wilson 1981, p. 8). This view was not shared by all, as Hjørland (2005, pp. 1 of 5) asked the question if 'behaviour' is regarded as a 'need', or just a 'demand'.

For the purpose of this study, 'information needs' will be considered as a state of uncertainty, where the researcher recognises that he has a gap in his knowledge about a certain aspect during the course of his project, or on a new topic in his field, which he proposes to investigate. This view corresponds with that of Carol Kuhlthau, as she implies that uncertainty is common at the beginning stage in any search (Kuhlthau 1991, p. 361; 1993, p. 343; 2005, p. 230).

Information needs experienced by ARC-SGI researchers could be a new project that the researchers are interested in or information about a new pest or disease that occurred in the field. A recent example at SGI is the 'False armyworm' that suddenly appeared in the wheat fields and caused a lot of damage to the crop in a certain area in South Africa. The appearance of the 'False armyworm' made the researcher realised that he had a gap in his knowledge about this specific pest. Information was needed to identify the larvae and to propose control measurements.

3.2.2 Information seeking

According to Case (2007, p. 86) 'information seeking' received less attention than 'information needs' in the literature. This could be explained by the fact that some authors take it for granted that people seek information when they have information needs and perhaps some feel that 'information needs' are more closely connected to 'needs' than 'information' (Case 2007, p. 86). Singh and Satija (2006, p. 29) defines information seeking as '… a human process that requires adaptive and reflective control over the afferent and efferent actions of the information seeker'. Information seeking depends not only on the situation, but also on the patron and his or her personality and characteristics. Marchionini (1995, p. 5) explains information seeking as '… a process in which humans purposefully engage in order to change their state of knowledge'.

The literature describes several modes of information seeking, such as directed and undirected, as well as active and passive searching (Bates 2002). Marchionini (1995, p. 106) identified three methods of browsing, that is direct, semi-directed and undirected. Direct browsing is systematic and focused, whereas semi-directed browsing is less systematic and more general in nature. Undirected browsing has no real goal and is more informal with little focus.

Bates and Marchionini's conclusions link up with Wilson (1997, p. 562), who described four basic categories of information seeking, which include passive attention, passive search, active search and on-going search. There is no intended need for information in passive attention. Examples are listening to the radio or watching television. Information gathering takes place unintentionally. Passive search occurs when a person performs a type of search that results in the researcher finding information that is relevant to him. In active search the researcher actively searches for specific information. Active search forms the basic framework for on-going search, which is done to keep researchers up to date with information. On-going search follows active search and is meant to expand the researcher's basic information (Wilson 1997, p. 562).

3.2.3 Information behaviour

Information behaviour is defined by Wilson (2000, p. 49) as '…the totality of human behaviour in relation to sources and channels of information, including both active and passive information seeking, and information use'. According to him, information behaviour includes face-to-face communication with other people, as well as the passive reception of information as in watching TV advertisements, without any need to act on the information he received.

According to Case (2007, p. 5) information behaviour 'encompasses information seeking as well as the totality of other unintentional or passive behaviors, as well as purposive behaviors that do not involve seeking, such as actively avoiding information'.

Satish Kumar, Gautam and Vijayaraghvan (2011, p. 17) describe information behaviour as '… a broad term encompassing the ways individuals articulate their information needs, seek, evaluate, select, and use information'.

3.2.4 Information seeking behaviour

Wilson (2000, p. 49) defines information seeking behaviour as 'the purposive seeking for information as a consequence of a need to satisfy some goal'. According to him, the researcher interacts with manual information systems (library) or with computer-based systems (World Wide Web). He considers information seeking behaviour as a subcategory of information behaviour, which he describes as '…the totality of human behaviour' (Wilson 2000, p. 49). Pettigrew, Fidel and Bruce (2001, p. 45) support this view.

Singh and Satija (2006, p. 30) describes information seeking behaviour as an interactive process between three elements, people, information and system. Patrons experience a need for information and make use of formal systems to satisfy those needs.

For the purpose of this study, the term, 'information seeking behaviour' will be used. Taking all the definitions in consideration, the definition by Wilson is accepted. It compares favourably with the focus of this study, which concentrates on the patrons, their information needs and the services and sources available through the library. The patrons in this study are the staff members of SGI - mainly the researchers. It is assumed that they experience a need for information, which results from the work that they are busy with, after which they search for information using different options until they are satisfied or have reached their goal.

3.3 LITERATURE REVIEW OF INFORMATION SEEKING BEHAVIOUR IN AGRICULTURAL AND RELATED CONTEXTS

Although there is a great deal of information available on information seeking behaviour and information needs, limited information is available in agricultural context or on agricultural researchers (Singh & Satija 2006, p. 26). According to Majid, Eisenshitz and Anwar (1999, p. 226) most of these studies were performed in the USA, Great Britain and other developed countries. Several studies on information seeking behaviour were carried out at universities and research organisations and

focused on students, academic personnel and researchers/scientists (Abdoulaye 2002; Adio & Arinola 2012; Bichteler & Ward 1989; Fidzani 1998; Kim 2009; Kuruppu & Gruber 2006; Lumande & Mutshewa 1999; Majid, Anwar & Eisenshitz 2000; Malliari & Kyriaki-Manessi 2007; Patitungkho & Deshpande 2005; Sheeja 2010; Singh & Satija 2008; Xie 2009).

Studies on information seeking behaviour in South Africa include Du Preez (2008) and Du Preez and Fourie (2009), which focused on consulting engineers as well as Mostert and Ocholla (2005) with their emphasis on parliamentarians in South Africa. Viviers and Calof (2002) studied the international information seeking behaviour of South African exporters. Milward (1994) and JA Fourie (1995) focused on teenagers and pupils respectively. Examples of Web information seeking behaviour in South Africa are Fourie (2006b); Nkomo (2009) and Thatcher (2006). Information seeking behaviour in the healthcare environment includes the studies of Fourie (2008); Fourie and Bakker (2009) as well as Fourie and Claasen-Veldsman (2011). The study of Nel and Fourie (2010) focused on the information behaviour of veterinary practitioners in South Africa.

Various studies focused on the transfer of information to rural areas, small-scale farmers and on extension services, such as Lwoga, Stilwell and Ngulube (2011); Meitei and Devi (2009); Meyer (2000); Meyer and Boon (2003); Munyua and Stilwell (2010) as well as Pezeshki-Rad and Zamani (2005). Apart from Van Niekerk (1988; 1990; 1993), it was difficult to find information specifically on agricultural researchers in South Africa, which shows that there is a need for focusing on this group. Van Niekerk (1990, p. 52) noted that at that time, the information requirements of researchers have not been studied in detail in South Africa. Studies on the development of models for various purposes include the information needs and information seeking behaviour model of students in Pakistan (Qureshi, Iqbal & Khan 2008), knowledge transfer model for agricultural engineering in Bavaria (Quendler & Boxberger 2010) and the model for geography teachers in Lesotho (Bitso 2011).

From the literature consulted, which consisted of journal articles and books, the following points were prominent, namely the characteristics of patrons; models of information seeking behaviour; information sources chosen by researchers; the format in which they prefer their information; as well as the importance of library instruction and information literacy. These points are discussed in more detail in the next paragraphs.

3.3.1 Characteristics of patrons

Rosenbloom and Wolek (1967 cited in Singh & Satija 2006, p. 29) identified characteristics that are linked to information seeking behaviour as seniority,

experience, educational level, professional activity and orientation. In a survey done by Tenopir et al. (2009, p. 139) amongst several universities in the USA and Australia characteristics, like subject discipline, responsibilities, achievement and age, influenced their information seeking habits. The survey targeted academic faculty members of all the major areas, including life sciences. The study concluded that scholarly articles are important to the academics, but variations occur in their reading habits, which contribute to their characteristics (Tenopir et al. 2009, p. 147). Personality, age, gender, academic background and experience with a system, are characteristics mentioned by Zhang and Chignell (2001, p. 445). The study done by Zhang and Chignell was aimed at four groups, namely librarians and information specialists, graduate students, undergraduate students and high school students (Zhang & Chignell 2001, p. 449). They investigated the effect of four patron characteristics on their mental information retrieval systems, which are professional and educational status, first language, academic discipline and computer experience (Zhang & Chignell 2001, p. 447). The study concluded that language had no significant effect on mental models, but the other three characteristics did show a significant effect (Zhang & Chignell 2001, p. 452).

Line (1969, p. 9) has identified three major factors (patrons, types of need and possible solutions) that concern the study of information requirements in the social sciences. Characteristics, such as, age, experience, background, seniority, solitary or team worker, persistence, thoroughness, orderliness, motivation, independence, breadth of approach, information threshold, awareness of sources of published information, awareness of non-literary media of communication and languages understood are considered important aspects of patrons (Line 1969, p. 9).

It is important to note that patron characteristics is a factor to bear in mind as it influences the way researchers search for information, but for the purpose of this study, it is not going to be investigated in depth.

Characteristics, linked with processes involved, resulted in models developed to explain the information seeking behaviour of patrons. A few of the models are discussed in section 3.3.2.

3.3.2 Models of information seeking behaviour

According to Pettigrew, Fidel and Bruce (2001, p. 54) the researchers of information seeking behaviour have explained variations in the behaviour of patrons according to the characteristics of the patrons, as well as the processes they are involved in. These studies resulted in models that reveal a number of characteristics of the patron when searching for information. It also describes the emotional responses and cognitive conditions that a patron experience when searching for information. The

studies confirm that information seeking behaviour is described as a set of processes or stages that the individual goes through and that there are trustworthy ways of mapping these stages, e.g. in models. Wilson (1999, p. 250) defined a model as follows: 'A model may be described as a framework for thinking about a problem and may evolve into a statement of the relationships among theoretical propositions'.

Wilson (1999, p. 252) reported on a number of information seeking behaviour models, which are, Wilson's model of 1981, Dervin's model of 1983, Ellis's model of 1989 and 1993, Kuhlthau's model of 1991 and Wilson's expanded model of 1996. They were chosen for purposes of discussion in this chapter because, according to the researcher, the research processes of agricultural researchers concur to some extent with their stages or categories.

3.3.2.1 Wilson's models of information seeking behaviour

Wilson has developed several models of information behaviour since 1971, with the first set published in 1981 (Wilson 2005, p. 31). He starts with the model on user studies published in 1981 (Wilson 1981, p. 4) followed by the second one in the same year regarding information seeking paths (Wilson 1981, p. 6). He developed a third model in 1981 on information seeking behaviour (Wilson 1981, p. 8). In 1996 he published a revised general model on information seeking behaviour based on his second and third models of 1981 (Wilson 1999, pp. 256-257; Wilson 2005, p. 34).

Wilson's idea of the models of 1981 was developed over a number of years and dates back to 1971 'since wrestling with the concept of "information need" with students at the University of Maryland' (Wilson 1981, p. 13). In Wilson (2005, p. 31), he reports that the models of 1981 had their origins in a doctoral seminar presentation at the University of Maryland in 1971 when they attempted to map the processes in 'user needs research'.

Two of his models will be discussed in the next paragraphs, namely one of his 1981 models as well as his 1996 model.

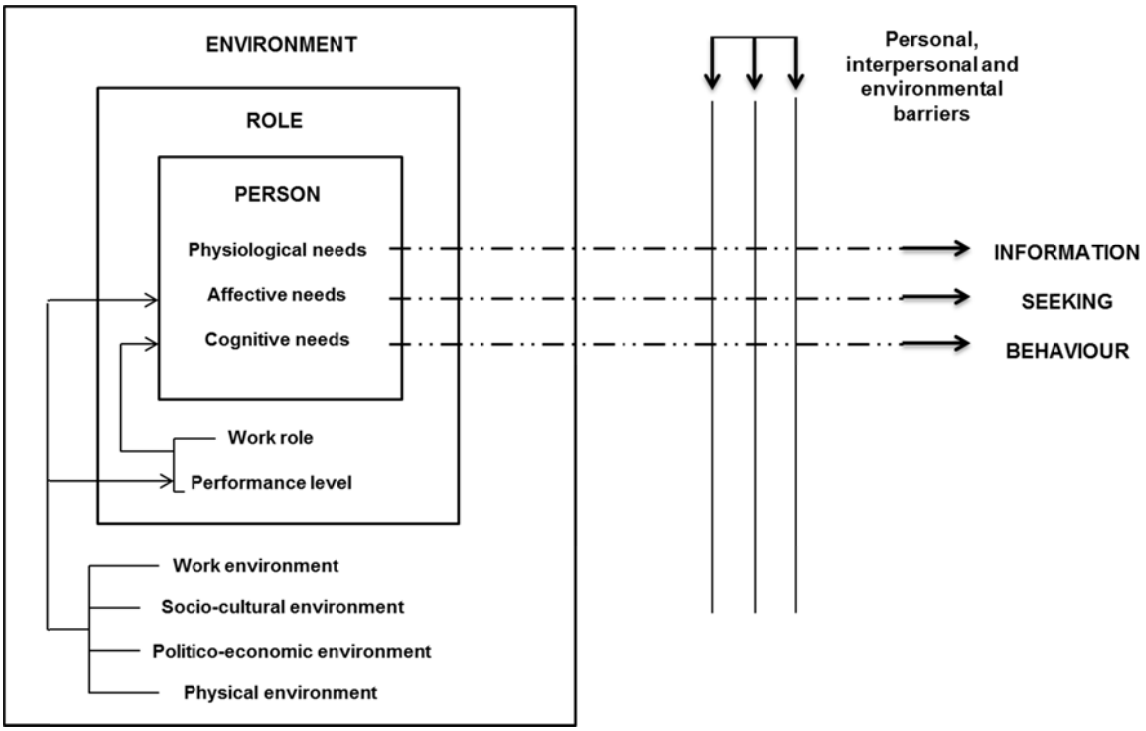
3.3.2.1.1 Wilson's 1981 model

Wilson's third model of 1981 (Figure 3.1), a model of information seeking behaviour, is based on two propositions and he argues firstly, that information need is not a primary need, but a secondary need, which stems out of a basic need (Wilson 1999, p. 252). Secondly, in the researcher's quest for information, he will come across barriers of different kinds. Basic needs are divided between physical, affective and cognitive needs that give rise to information seeking behaviour (Wilson 2005, p. 32). The context of any of these needs may be the person himself or the role demands of

the person's work of life, or the environment. The barriers that influence the search for information will rise out of the same context. These barriers are represented as personal, interpersonal and environmental barriers to information seeking (Wilson 1981, p. 8).

Wilson describes this model as a macro-model of the gross information seeking behaviour and it shows how information needs arise and which factors may prevent the actual search for information (Wilson 1999, p. 252). This model 'embodies' a set of hypotheses about information behaviour that are testable, for instance, the proposition that information needs in different work roles will be different or that personal 'traits' may inhibit or assist information seeking (Wilson 1999, pp. 252-253). The model can thus be regarded as a source of hypotheses. This study does not test a hypothesis, therefore this information is only mentioned as observed in the literature.

Figure 3.1: Wilson's 1981 model of information seeking behaviour (Wilson 1981, p. 8; 1999, p. 252)



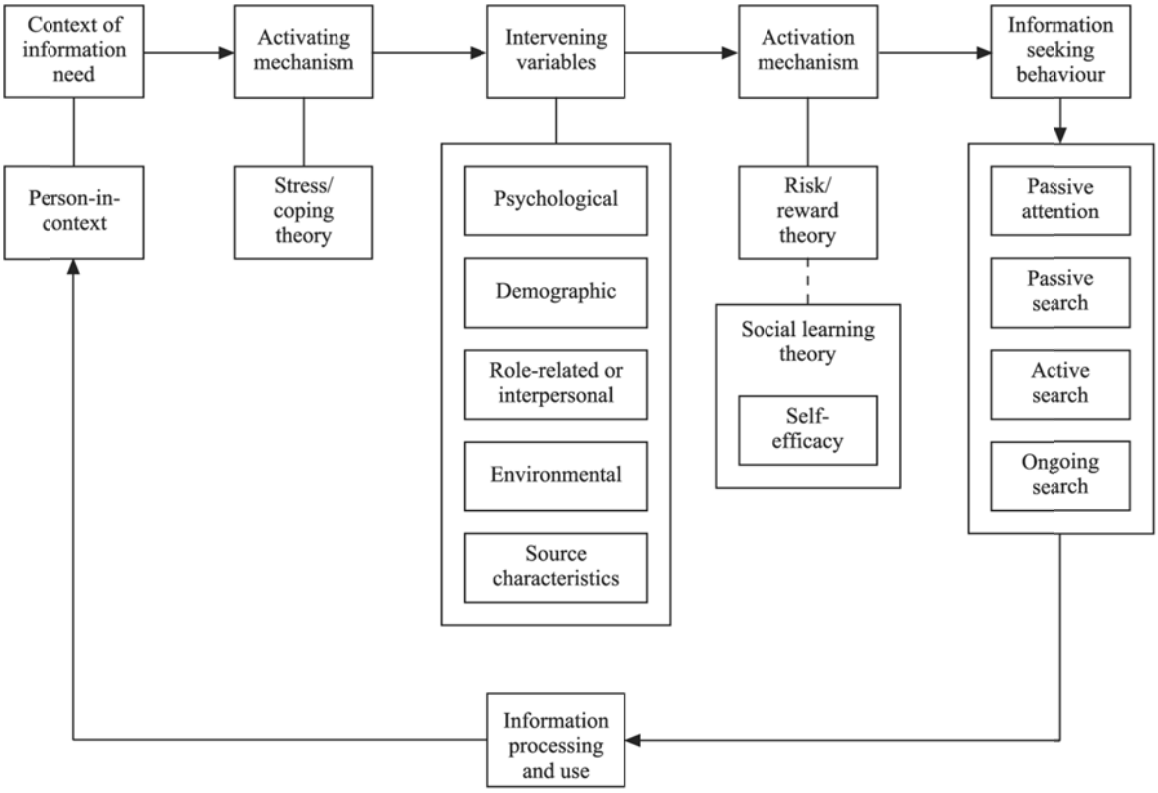
This 1981 model of information seeking behaviour is the model most cited in the literature (Wilson 2005, p. 32).

3.3.2.1.2 Wilson's 1996 model

Wilson developed his previous models into a new model of information seeking behaviour, which was published in 1996 in a research report (Wilson 2005, p. 33). He

also relied on research from fields other than information science, which include decision-making, psychology, innovation, health communication and consumer research (Wilson 1999, p. 256). He kept the basic framework of the model in 1981 where the person in context is still the focus of information needs. 'Intervening variables' now presents the barriers, and 'information seeking behaviour' is also identified (Wilson 1999, p. 256). The decision to take action to satisfy information needs is related to the stress-coping theory of Folkman and the decision to search information sources is associated with the risk-reward theory of Settle and Alreck as well as with the theory of self-efficacy of Bandura (Wilson 2005, p. 34). Wilson incorporated Ellis's 'behavioural characteristics' of information seeking in the 'active search' mode of information seeking. He also included Erdelez's 'information encountering' in his 'passive attention' mode (Wilson 2005, p. 34). Dervin's Sense-making theory is also incorporated as it deals with the perception of a need for information (Wilson 2005, p. 35).

Figure 3.2: Wilson's 1996 model of information seeking behaviour (Wilson, 1999 p. 257)



According to Wilson (1999, p. 257), the 1996 model is still one of macro-behaviour, but the expansion and inclusion of other models makes it a richer source for further research than his earlier model. Niedźwiedzka (2003, pp. 7 of 12) reported that the suggested relationships among the theoretical propositions of Wilson's model were not tested and served only as 'a framework for thinking about the problem'.

3.3.2.2 Dervin's sense-making model of 1983

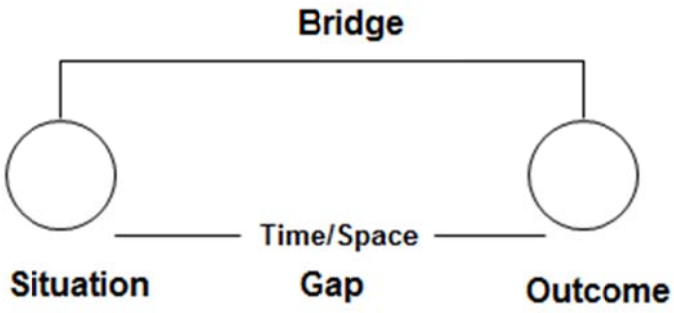
'Sense-making' is seen as a theoretic net, a set of assumptions and propositions and a set of methods developed to study the making of sense that people do in their everyday experiences (Dervin 1992, p. 61). Dervin describes it as a set of metatheoretic assumptions and propositions about the nature of information, the nature of human use of information and the nature of communication (Dervin 1992, pp. 61-62). In short, it can be summarised as 'a coherent set of theoretically derived methods for studying human sense-making' (Dervin 1992, p. 62).
The way in which information is conceptualised is fundamental to the specific application of sense-making to the study of human use of information and information systems. Information is conceptualised as that sense created at a specific moment in time-space by one or more humans (Dervin 1992, p. 63). Information does not exist apart from human behavioural activity. Another assumption is that human use of information and information systems need to be studied from the perspective of the actor and not from the perspective of the observer (Dervin 1992, p. 64). As sense-making focused on behaviour, it assumes that the important things we learn about human use of information and information systems must be conceptualised as behaviours (Dervin 1992, p. 65). It is explained by the step that humans undertake to construct sense of their worlds. These step-takings involve both internal behaviours as well as external behaviours (Dervin 1992, p. 65).

According to Wilson (1999, p. 253) sense-making is implemented in four constituent elements, namely:

- A 'situation' in time and place, which describes the context in which the information problems arise;
- A 'gap', that identify the contextual situation and the desired situation;
- An 'outcome', which is the consequences of the sense-making process; and
- A 'bridge', illustrates how the gap is closed between the situation and the outcome.

Dervin illustrated the elements in a triangle, which is situation, gap/bridge and outcome (Dervin 1992, p. 69; Wilson 1999, p. 253). Wilson found it preferable to illustrate the bridge metaphor more directly as presented in Figure 3.3.

Figure 3.3: Brenda Dervin's sense-making framework (Wilson 1999, p. 254)



Dervin (1992, p. 82) states that sense-making assumes that the important aspects of information use are captured by looking at qualities of gap-defining and gap-bridging:

> 'A person in a moment defines that moment as a particular kind of gap, constructs a particular strategy for facing the moment, and implements that strategy with a particular tactic'.

3.3.2.3 Ellis' behavioural models of information seeking behaviour of 1989 and 1993

According to Ellis, many studies were done on the characteristics of social science information and the information seeking activities of social scientists (Ellis 1989, p. 172). However, these studies did not provide detailed information on the perceptions of academic social scientists of their own information seeking activities, which was necessary for an in-depth analysis of information retrieval system requirements (Ellis 1989, p. 172).

Ellis interviewed social scientists at the University of Sheffield and this study resulted in identifying six generic characteristics of the information seeking patterns of social scientists (Ellis 1989, p. 178; Ellis & Haugan 1997, p. 385). The six characteristics were starting, chaining, browsing, differentiating, monitoring and extracting. He extended his studies to academic researchers, physicists and chemists, and found that his model - with slight difference in terminology and a little modification - fits the behaviour of these fields. The modification for chemists involved the incorporation of two extra characteristics, namely verifying and ending (Ellis 1993, p. 482). Ellis sometimes referred to 'characteristics' (Ellis 1989, p. 178; Ellis & Haugan 1997, p. 384) as 'features representing characteristics' (Ellis 1993, p. 480) and sometimes to 'categories' (Ellis, Cox & Hall 1993, p. 359; Ellis & Haugan 1997, p. 388) when referring to the six and eight characteristics. The six characteristics were first identified for the social scientists and Ellis added two extra characteristics to his model to include the chemists. For the purpose of this study, the term 'characteristics' will be used to avoid confusion.

Ellis employed the 'grounded theory' approach for his study of academic researchers (Ellis 1993, p. 473). According to Leedy and Ormrod (2005, p. 140), 'a grounded theory study uses a prescribed set of procedures for analyzing data and constructing a theoretical model from them'. 'Grounded' refers to the idea that the theory that is established from the study, comes from data that is selected in the field and not from the research literature (Leedy & Ormrod 2005, p. 140). Grounded theory focuses on a process and the goal is to develop a theory about the process. Ellis compared the model for the social scientists to the model of the chemists and found that the main difference was the two extra categories, namely verifying and ending, which were definite categories identified in the study of chemists (Ellis, Cox & Hall 1993, p. 365).

He also extended the behavioural approach to modelling the information seeking patterns of academic researchers to include that of engineers and research scientists (Ellis & Haugan 1997, p. 385). He found that eight characteristics were sufficient to describe the information seeking patterns of the researchers to form the behavioural model, which are surveying, chaining, monitoring, browsing, distinguishing, filtering, extracting and ending (Ellis & Haugan 1997, p. 388).

Ellis's behavioural model consisting of six characteristics of information seeking are as follows (Ellis 1989, pp. 187-198; Ellis, Cox & Hall 1993, p. 359):

- **Starting:** Starting refers to characteristics of the information seeking patterns of researchers who are commencing work on a new topic;

- **Chaining:** During this stage, the researcher follows footnotes or citations in material known to them. Chaining can take two forms, namely backward chaining (following up on references cited in material) and forward chaining (identifying citations to material consulted or known);

- **Browsing:** During browsing relevant journal sources are identified. Semi-directed or semi-structured searching commences;

- **Differentiating:** Differences among sources are used as filters on the nature and quality of the material examined;

- **Monitoring:** The researcher maintains awareness of developments in an area through regularly following particular information sources; and

- **Extracting:** Extracting is the activity of going through a particular source selectively identifying relevant material from that source.

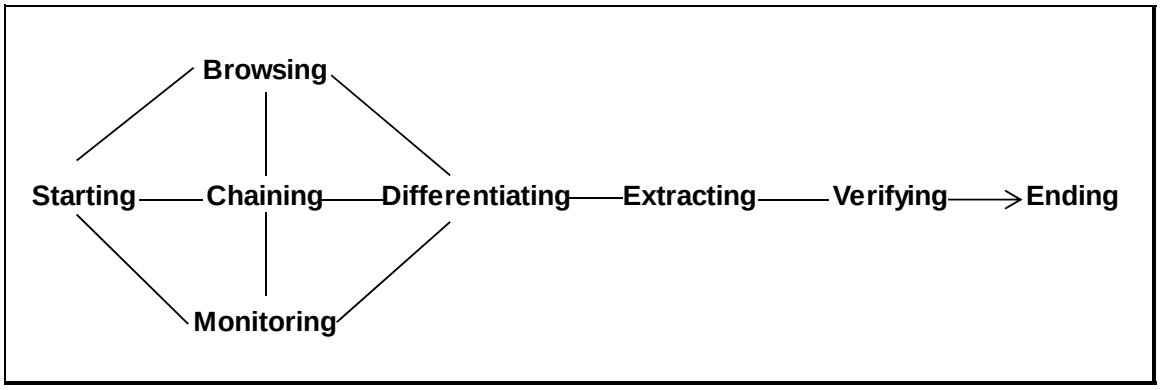
These characteristics were extended to include physicists and chemists with the next two characteristics (Ellis, Cox & Hall 1993, p. 359):

- **Verifying:** Verifying is the activity where the researcher verifies the accuracy of information; and
- **Ending**: Ending is the activities typical of information seeking at the end of a topic or project.

The eight characteristics of Ellis were confirmed by Järvelin and Wilson (2003, pp. 3 of 14) and Wilson (1999, p. 254):

Wilson incorporated Ellis's behavioural characteristics in a modified version of the 1981 model described earlier in section 3.3.2.1.1 (Wilson 2005, p. 34). According to Wilson (1999, p. 255), the models of Ellis and himself function at different levels of the information seeking process, which is demonstrated by the ability to nest one within the other as illustrated in Figure 3.4.

Figure 3.4: Wilson's version of Ellis' behavioural framework (Wilson 1999, p. 255)



In a study on engineers and research scientists, the researchers found that five different phases featured in the projects of the participants: evaluation of alternative solutions, development and testing, implementation, commercialisation and summary of experiences (Ellis & Haugan 1997, pp. 389-390). The first phase consists mainly of information gathering and the second phase's main purpose is to develop a technical and economic solution (Ellis & Haugan 1997, pp. 390-391). This second phase include experimental work as well as reporting with recommendations on implementation. In the final phase, an evaluation report is written.

Based on observation during working experience at ARC-SGI since the middle of 1997 (the time that the researchers began working at ARC-SGI) it has been noted that the workflow of the researchers at ARC-SGI closely resembles the phases identified by Ellis. The researchers at ARC-SGI work on projects, which usually starts with problems or challenges in the agricultural field that needs to be addressed. In

the beginning, information is gathered and a strategy is planned. This is followed by experimental work, often both in laboratories as well as in the field. The results are reported in a progress report and include recommendations regarding future planning and continuation of a project.

According to Ellis (2005, p. 140) the behavioural approach does not address cognitive or affective aspects of information seeking, but as it was tested among different groups, the approach indicates an appropriate way of modelling the information seeking behaviour of researchers in academic as well as research environments.

3.3.2.4 Kuhlthau's model of information seeking behaviour

Kuhlthau's model of the information search process (ISP) is based on a series of five studies, which concentrated on students in universities, colleges and secondary schools (Kuhlthau 1991, p. 364). According to Kuhlthau (1983 cited in Kuhlthau 1991, p. 364) these studies resulted in the development of the ISP model. It consists of six stages and is associated with feelings (affective), thoughts (cognitive) and actions (physical) (Kuhlthau 2004, p. 44). Kuhlthau's studies were among the first to investigate the affective aspect in the process of information seeking together with the cognitive and physical aspects (Kuhlthau 2005, p. 231).

Kuhlthau (1991, pp. 366-368; 1993, pp. 342-344) identify six stages in the information seeking process as follows:

- **Initiation**: At this stage, the researcher becomes aware of his lack of knowledge about a certain subject. He/she experiences feelings of uncertainty and the task is to recognise his/her need for information. Thoughts centre on contemplating the problem and relating the problem to previous experience. Actions involved in this stage are discussing possible topics and approaches;

- **Selection:** The task is to identify and select the area or topic that needs to be investigated. A brief sense of optimism is felt after the selection is done and the researcher is ready to begin the search. Thoughts centre on weighing possible topics against personal interest, assignment requirements, the available information and time allowed. An action during this stage is to confer with other people;

- **Exploration**: The task is to search or to investigate for information on the topic for a better understanding thereof. During this stage feelings of

confusion, uncertainty and doubt are present. Thoughts centre on trying to become more oriented and informed about the topic;

- **Formulation:** This stage is the turning point when feelings of confidence increase. The task is to form a focus from the information gathered. The researcher's thoughts are more clearly and his/her perspective of the topic more focused;

- **Collection:** The task is to gather information related to the focused topic. Interaction between the patron and the information system functions most effectively and efficiently. Confidence tends to increase during this stage as uncertainty subsides; and

- **Presentation:** At this last stage, the task is to complete the information searching process and to resolve the problem. Feelings of relief and satisfaction is felt when the search was successful, but disappointment if it was unsuccessful. Actions may involve a summary search and the organising of strategies to present the information acquired.

Ikoja-Odongo and Mostert (2006, p. 150); Singh and Satija (2006, pp. 31-32) and Wilson (1999, p. 255) confirmed Kuhlthau's six stages of the information process and accompanying associations with feelings, thoughts and actions as well as the appropriate information tasks.

Figure 3.5: Kuhlthau's model of the information search process (Kuhlthau 2004, p. 82)

	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (affective)	Uncertainty	Optimism	Confusion frustration doubt	Clarity	Sense of direction/ confidence	Satisfaction or disapoint-ment	
Thoughts (cognitive)	Vague →			Focused → Increased interest			Increased self-awareness
Actions (physical)	Seeking relevant information Exploring →			Seeking pertinent information → Documenting			

To test the usefulness of the ISP model developed in the 1980's, a study was conducted at the Rutgers Centre for International Scholarship in School Libraries during 2003-2005 (Kuhlthau, Heinström & Todd 2008). The research was based on a literature review as well as an empirical work involving ten New Jersey public schools. The results confirmed that the model was still very useful for explaining information behaviour and that it has: '... value as a research tool as well as for practical application' (Kuhlthau, Heinström & Todd 2008, pp. 1 of 14).

Through observation it seems as if researchers at ARC-SGI might be able to identify with Kuhlthau's model. They are confronted with new projects of which they may have limited knowledge. At the beginning of a new project, general information on the topic might be gathered and as the search progresses, it mostly becomes narrower and more specific. When reaching the goal of the research project, the task is complete and when the problem is resolved, they may feel satisfied.

Kuhlthau (2000, p. 38) identifies three very important findings regarding information seeking for librarians in her research. Information seeking occurs over a period of time and is not a single event; secondly, it is a holistic process of seeking meaning and not a simple question and answering activity; and thirdly the realisation that uncertainty most often increases during the seeking process rather than decreases. With this in mind, librarians should concentrate on the patron, his feelings during the various processes and know when to put a little extra effort in when assisting the patron. For librarians this argument again stresses the importance of knowing the patron and when to add a bit of personal touch to the service.

3.3.3 Research studies on information sources and library services

Several studies were done in the past on library patrons' and non-patrons' preferred methods of finding information as well as their preference for information sources. With regard to agriculture, specific groups that were studied include agricultural students and academics at universities and technical universities, scientists at agricultural institutions, extension workers and small-scale farmers in rural communities. A few of these studies, which are agricultural related, are highlighted in the next paragraphs.

Van Niekerk (1990) conducted an extensive study regarding information in South African agriculture and the role that the library should play. She identified the different groups who use agricultural information as policy-makers and administrators; researchers; extension officers/advisors; teachers; lecturers; students; support services; first world farmers; third world farmers; journalists, writers and producers of TV/radio programmes; rural developers and farmworkers. Information channels are divided in informal channels, such as two-way communication (verbal dialogue, correspondence and electronic or other media); formal channels, for example conventional and non-conventional literature and secondary services (databases); public channels; mass media and organisational communication.

Van Niekerk (1990, p. 133) did a survey to identify which sources of agricultural information are used most by South African agriculturists. It showed that books, South African conference proceedings, South African journals, theses, dissertations and foreign journals claimed the top five positions.

French (1990) reported on various studies by other researchers that were done among scientists and agricultural scientists regarding their information needs. According to these studies, their initial source of preference is contact with other people, especially their colleagues. This includes telephone calls, electronic mail, correspondence and conferences. A study done by Olsen et al. (1985 cited in French 1990, p. 420) of Cornell University agricultural scientists in 1985 showed that personal contact and the patrons' own personal files were important in keeping informed of current research and literature. Library services rated as 'essential' or 'very important' were interlibrary loans, telephone reference, photocopy service, reference librarians and computer literature services.

Fidzani (1998, p. 330) examined the information seeking behaviour and the awareness of library resources of graduate students (including students in environmental science) at the University of Botswana. He found that for research, the top three sources were journals, library books and thirdly, textbooks (Fidzani 1998, p. 334). The study also revealed that the students need training in how to use the library's services and resources. According to Fidzani (1998, p. 337) a marketing strategy, to promote the services and sources should be implemented.

Frick and Groenewald (1999, p. 241) emphasised the need for agricultural data and information in South Africa. Information is important for public and private decision-makers. These include policy-makers, researchers, agricultural service industries, farmers and extension officers. In agricultural research studies, the focus is usually on the researchers and scientists' information needs (Frick & Groenewald 1999, p. 248). They conclude by stating that agricultural information becomes only an economically valuable commodity in the context of decision making (Frick & Groenewald 1999, p. 250).

During 1999, Lumande and Mutshewa (1999, p. 108) carried out a study at the Science Faculty of the University of Botswana. Similar to the study of Fidzani (1998), amongst other objectives, this study concentrated on the information resources used by science academics. The result also showed that journals were the most popular source, followed by textbooks and in third place, the Internet (Lumande & Mutshewa 1999, p. 109).

Majid, Eisenschitz and Anwar (1999, p. 227) conducted a study into the library use patterns of Malaysian agricultural scientists. They found that the scientists visited the library for searching the OPAC and scanning journals, while sending semi-professionals and junior scientists for photocopies and checking out books and other material (Majid, Eisenschitz & Anwar 1999, p. 234). Scientists who considered the location convenient more often visited the library. The scientists also used the library more frequently while busy with special projects, like research proposals and the

writing of research reports. They concluded that librarians should become an integral part of the research system in order to support their patrons effectively. In the same study Majid, Anwar and Eisenschitz (2000, p. 145) also explored the information needs and information seeking behaviour of agricultural scientists. They found that patrons who are informed about new arrivals in the library and through current awareness services are more able to keep up to date with new information in their field (Majid, Anwar & Eisenschitz 2000, p. 156). The three most important sources that they prefer using are journal articles, review articles and communication with professional colleagues (Majid, Anwar & Eisenschitz 2000, p. 159). This study also revealed that where the patrons are involved in the selection of new library material, they felt that the library is more effective and that the collection is more relevant to their needs (Majid, Anwar & Eisenschitz 2001, p. 180). The physical appearance of the library, library use skills and patron education programmes were also very important to the researchers as it promotes the effectiveness of the library (Majid, Anwar & Eisenschitz 2001, p. 181).

The purpose of the study done by Meyer (2000) was how the transfer of information can improve the usefulness of information as a resource in the upliftment of small-scale farmers to contribute to their own food security (Meyer 2000, p. 1). She found that the heart of the problem of information related issues were the fact that small-scale farmers are not involved in planning development programmes for rural agriculture and that there is a lack of modern farming practices by small-scale farmers as well as a lack of appropriate methods to transfer modern practices to small-scale farmers (Meyer 2000, p. 3).

In the developing world a great number of the rural population are either illiterate or only functional literate (Aitchison & Harley 2006; Meyer 2000; Nyareza & Dick 2012; Stefano et al. 2005). They are unable to use modern IT such as libraries, bookshops and the electronic media. They have an oral culture where information is transferred by word of mouth and demonstrations. Information is usually received through extension officers or developmental efforts of multinational corporations or non-governmental organisations (Meyer 2000, p. 4).

Meyer (2000, pp. 215-216) recommended that more attention should be paid to the information behaviour of people originating from oral communities; that extension officers should be more adequately trained to transfer information to small-scale farmers; that policy-makers should be aware of the importance of information as a resource for development; and that information should be transferred in such a way that rural communities are more actively involved in their own upliftment, rather than passive recipients.

Oladele (2002) examined the information seeking and utilisation habits of the agricultural researchers in Nigeria. The results indicated that the researchers at that time did not use the WWW or electronic mail to access information. Agricultural databases were only used by a small proportion of researchers and the study found that researchers in Nigeria were informational deprived. The study concluded that appropriate information sources, as well as the facilities to enhance their use, are very important and researchers should be trained to search and retrieve relevant information.

In her study on the effective use of information and communication in rural development, Meyer (2003) describes the attributes of information handling among rural farmers who are used to an oral tradition. Appropriate communication mechanisms and knowledge of the rural farmer's information behaviour should be applied to reverse the negative effects of transferring new information and to achieve positive results.

Stefano et al. (2005) conducted a study into the information needs of rural farmers in KwaZulu-Natal, with emphasis on printed materials. As with other studies of small-scale farmers, preference was given to oral communication, such as discussions with local people, intermediaries and chemical and seed suppliers (Stefano et al. 2005, p. 61).

The farmers valued printed material as well, because they can refer to it again any time it is needed. If they forget something, they can always look it up again (Stefano et al. 2005, p. 61). In the study, the farmers were presented with a few examples of printed material. A newsletter came out as their first choice. Secondly, was a step-by-step instruction manual. Their third choice was two books presented to them (Stefano et al. 2005, p. 63). The study revealed that the problems with printed materials were twofold: the farmers have limited access to relevant material and they have low levels of literacy. Radio and television also featured as information channels, although many regarded it irrelevant, because the content was mostly aimed at large-scale commercial farmers (Stefano et al. 2005, p. 61).

In conclusion, Stefano et al. (2005, p. 62) found that there exists a definite place for printed material in providing agricultural information, especially if it is written in their own local language.

Kuruppu and Gruber (2006, pp. 610-611) investigated the information needs of agricultural and biological scientists at Iowa State University during 2004 and 2005. They needed to find out what types of information the scientists access, what resources they know, which tools and processes they use to locate information and what additional resources and services would they like to be available. The results

showed that the scientists relied mainly on primary information sources, such as scholarly journals for their research and for teaching, and they use journal articles and books (Kuruppu & Gruber 2006, pp. 612). For a general overview of a topic, they turn to secondary sources of information, such as the web. Other important sources of information include colleagues, professional association meetings and co-researchers. The scientists used indexes and databases to search for journal articles and prefer to access resources through the library's website, rather than visiting the library itself (Kuruppu & Gruber 2006, p. 613). They found that researchers sometimes choose convenience of access over the quality of information sources. Databases and online indexes are regarded as convenient, where search engines are used because of its easiness (Kuruppu & Gruber 2006, p. 613). Indexes regarded as most popular were PubMed and AGRICOLA, while Biosis Previews, CAB Abstracts and Web of Science were mentioned several times (Kuruppu & Gruber 2006, p. 615). The study revealed that scientists and graduate students were confused about library services and unaware of many of its functions, with the exception of interlibrary loans.

Yomi Alfred and Odefadehan (2007, p. 62) conducted a study in the southwest of Nigeria on the information needs of extension workers. Their needs were classified into technical, commercial, social, legal and general information. General information, that consists of extension methods, administration and supervision, rated the highest during the investigation (Yomi Alfred & Odefadehan 2007, p. 72). The sources mostly used by the extension workers are their manager or supervisor, conferences and seminars, research reports, books and journals and in the fifth place, research stations (Yomi Alfred & Odefadehan 2007, p. 73). Training also featured very high as a source of information and was rated as the most effective source as well (Yomi Alfred & Odefadehan 2007, p. 74). The extension workers received regular training in new technologies, which will hopefully result in the more effective use of the Internet, CD-ROMs and other electronic media. They concluded that there was a need for further training in the electronic media and basic training in computer literacy.

Singh and Satija (2008, p. 38) conducted a study to investigate the information seeking behaviour of agricultural scientists working in the Indian Council of Agriculture Research (ICAR) and Punjab Agricultural University. They found that the library was the most preferred source of information, followed by reviewed articles and in third place, communication with colleagues (Singh & Satija 2008, p. 39). They divided the needs for information in three categories, namely the 'current approach', the 'everyday approach' and the 'exhaustive approach'. During the 'current approach', the researcher investigates the work that other researchers recently have done on a topic. They try to keep up-to-date with current progress. The 'everyday approach' happens when a researcher needs specific information regarding his research work or a problem that arose. Background information is needed when a

researcher starts a new project and this process is called the 'exhaustive approach' (Singh & Satija 2008, pp. 41-42). The results of the study showed that during the 'everyday approach', the journals were the most preferred source of information, followed by conversations with colleagues and experts and thirdly books and monographs (Singh & Satija 2008, p. 43). The three most important information sources used for keeping up-to-date (the current approach), were journals, lectures/conferences/seminars and books/monographs. For background information, books/monographs were ranked first, followed by journals and conversations with colleagues and experts (Singh & Satija 2008, p. 44). They stated that patrons tend to use information sources that are known to them and easily accessible, despite of the quality thereof.

Agboola (2010, p. 62) investigated the information use by agricultural science students in three Nigerian universities. His research concentrated on patrons' library visits, print materials and electronic resources and problems that students experience in accessing information. According to the results, students made use of textbooks as the most preferred source of printed materials, followed by journals and newspapers. Of the electronic databases, The Essential Electronic Agricultural Library (TEEAL) was the most use database, with CAB Abstracts in die second place and AGRICOLA in the third place (Agboola 2010, p. 64). Students indicated that they prefer electronic resources above the printed resources. Limited Internet connectivity was identified as the biggest problem in accessing electronic information as well as books that are not on the shelves (Agboola 2010, p. 64).

Biradar, Dharani Kumar and Mahesh (2009) executed a study among agricultural students at the Agricultural Science College, Shimoga in India. The purpose of the study was to examine the frequency and purpose of their visits to the library, to identify important information sources, and to assess the usefulness of agricultural science journals and services provided by the library (Biradar, Dharani Kumar & Mahesh 2009, p. 64). They found that the library was visited on a daily basis by 77.22% of the respondents for the main reason to read journals and to borrow books. The frequency of the use of information sources used in the library revealed that they preferred books, followed by journals with dictionaries in the third place (Biradar, Dharani Kumar & Mahesh 2009, p. 64).

Meitei and Devi (2009) conducted a study in connection with the information needs of the farmers in the rural areas of Manipur State, India. They mentioned that rural farmers are not getting the right information at the right time, which leads to slow development of the rural farmers' community in sustainable agricultural development activities (Meitei & Devi 2009, p. 35). They investigated information needs and channels of information communication. Field acquisition, agricultural inputs, agricultural technology, agricultural credit, agricultural marketing and food technology

were identified as the focus of information needs of the farmers (Meitei & Devi 2009, p. 37). The farmers also indicated that they mostly used the 'radio' as the most common information channel, followed by the television and newspapers (Meitei & Devi 2009, pp. 38-39).

Niu et al. (2010, p. 869) conducted an investigation into the information seeking behaviour of academic researchers in natural science, engineering and medical science in the USA. The primary resources for searching for information are journals, web pages and personal communications. On a weekly or monthly basis, they read books and attend conferences annually (Niu et al. 2010, p. 874). When it comes to searching, they prefer metasearch tools that cover all content in all resources. Problems that they encounter included the need for bibliographic searches, better skills to find references to specific articles, too many results returned, which makes it difficult to identify most relevant content and also questions on the quality of the content (Niu et al. 2010, p. 876). The researchers' use of the library also came under scrutiny and they found that although physical visits to the library are decreasing, utilisation of the library's resources are increasing. Apart from traditional library functions, it is used as a quiet reading place, for access to computers and as a meeting place for students (Niu et al. 2010, p. 878). Patrons were generally very satisfied with the libraries, especially the personal attention from the librarians. The survey also revealed that the patrons are not always aware of resources and services (Niu et al. 2010, p. 879).

Lwoga, Stilwell and Ngulube (2011) conducted a study among rural farmers in Tanzania. They investigated, amongst others, access to agricultural information through face-to-face communication and printed materials and also through information and communication technologies. In the first category, the most preferred source of information was through neighbours/friends, followed by public extension officers and in the third place, parents/family (Lwoga, Stilwell & Ngulube 2011, p. 387). With the exception of books, printed material is not regarded as important, perhaps due to the unavailability of such material and the rural farmers' lack of a reading habit. In the second category, the most preferred choice was the radio, with cell phones and television in the second and third place (Lwoga, Stilwell & Ngulube 2011, p. 389).

Lwoga, Stilwell and Ngulube (2011, pp. 392-393) concluded that face-to-face communication and the radio remain the most important sources of information. Knowledge and information needs are very location specific. It is thus very important that local farmers should be incorporated in the design and development of new technologies.

Satish Kumar, Gautam and Vijayaraghvan (2011) undertook a survey among nine life science laboratories of the Defence Research and Development Organization (DRDO) in India. This includes the Defence Agricultural Research Laboratory (DARL) (Satish Kumar, Gautam & Vijayaraghvan 2011, p. 19). Their survey covered the information sources and types of publications preferred by the life scientists. The total preference of the scientists showed that they chose the 'collection of information from colleagues within their organisation' as their number one choice; 'library information centre' as their second choice and 'indexing and abstracting journals' as their third choice (Satish Kumar, Gautam & Vijayaraghvan, 2011, p. 20). The reasons for the scientist information needs are divided into three categories, namely the 'current approach', the 'everyday approach' and 'background information' (Satish Kumar, Gautam & Vijayaraghvan 2011, p. 21). The 'current approach' is explained as how the researcher keeps up-to-date with current information, the 'everyday approach' is when the researcher needs specific information during the course of his work or project and 'background information' occurs when the researcher starts working on a scientific problem and need relevant information. These categories correspond with the categories noted by Singh and Satija (2008, pp. 41-42).

The results of the survey showed that for the current approach, the scientists preferred 'journals' as their first choice of source. 'Lectures/conferences/seminars' emerged as second choice and 'books/monographs' as third choice (Satish Kumar, Gautam & Vijayaraghvan 2011, p. 22). For the 'everyday approach', the 'journals' also came in as first choice, 'books/monographs' as second choice and 'technical/research reports' as third choice. 'Books/monographs' was the first choice for 'background information', with 'yearbooks/annual reviews' as second choice and 'conversation with colleagues and experts' as the third choice (Satish Kumar, Gautam & Vijayaraghvan 2011, p. 22).

Nyareza and Dick (2012) conducted a study in Zimbabwe regarding the use of the radio to communicate agricultural information to rural farmers. Extension officers also transfer agricultural information, but are experienced as not very successful – probable due to the lack of transport (Nyareza & Dick 2012, p. 500). They proposed a Community Radio for Development model (CR4D) for the transfer of agricultural knowledge to farmers and the sharing of practical experience.

Not all of these studies are specifically aimed at agriculturists, but because researchers are also regarded as scientists - as explained in Chapter 1 (section 1.10.4) - one can assume that their preferences would compare favourably. The literature studies discussed are summarised in Table 3.1.

Table 3.1: Summary of the studies on information sources and library services

Author	Year	Focus group	Objective of the study
French	1990	Agricultural information patrons	To review information needs as identified by various reported studies
Van Niekerk	1990	Agricultural information patrons in South Africa, e.g. researchers	To determine preferred sources of information
Fidzani	1998	Graduate students (including science students)	To identify the information seeking behaviour and the use of information sources
Frick and Groenewald	1999	Public and private decision-makers in the agricultural sector	To discuss the importance of agricultural information based on a review of a selection of reported studies
Lumande and Mutshewa	1999	Scientific academic staff (including biological and environmental science staff members)	To identify the information seeking behaviour of science academics
Majid, Eisenshitz and Anwar	1999	Agricultural scientists and academics	To explore the library use patterns of agricultural scientists
Majid, Anwar and Eisenshitz	2000	Agricultural scientists and academics	To identify their information needs and seeking behaviour
Meyer	2000	Rural communities	To explore transfer of agricultural information
Majid, Anwar and Eisenshitz	2001	Agricultural scientists and academics	To determine library effectiveness
Oladele	2002	Agricultural researchers	To determine information seeking behaviour and information use
Meyer	2003	Rural farmers	To determine information attributes that influence them and

			communication mechanisms
Stefano, Hendriks, Stilwell and Morris	2005	Rural farmers	To determine access to information, preferred channels, printed materials and language
Kuruppu and Gruber	2006	Agricultural and biological scientists	To examine the information needs of the scientists
Yomi Alfred and Odefadehan	2007	Agricultural extension workers	To determine information needs
Singh and Satija	2008	Agricultural scientists	To investigate information seeking behaviour
Biradar, Dharani Kumar and Yahesh	2009	Agricultural students	To determine library visits, information sources and usefulness of agricultural journals and library services
Meitei and Devi	2009	Rural farmers	To investigate information needs and channels of information communication
Xie	2009	International corporation (Employees) State University (Students)	To investigate information seeking and retrieval
Agboola	2010	Agricultural students	To determine the information use of agricultural students
Niu, et al	2010	Academic researchers	To investigate information seeking behaviour
Lwoga, Stilwell and Ngulube	2011	Rural farmers	Access to agricultural information through face-to-face/printed methods and through IT

Satish Kumar, Gautam and Vijayaraghvan	2011	Life scientists	To investigate information seeking behaviour and preferred sources
Nyareza and Dick	2012	Rural farmers	To investigate the use of the radio for agricultural information transfer

3.3.4 Preferred format: printed material versus electronic media

Electronic resources have become a major point of discussion in library services in recent years. It has brought a significant change in search strategies for both librarians and researchers. According to Ritchie and Genoni (2007, p. 441) reference services in libraries has shifted readily from print to electronic sources and the reason for this is listed as usefulness, convenience and cost. Further advantages of searching electronically are the easy navigation within the text and from one article to another; it is more time saving than searching through printed material and the cost involved (Kirlidog & Bayir 2007, p. 103). Mounissamy and Swaroop Rani (2005, pp. 190-191) and Parihar and Pattnaik (2007, p. 39) investigated the use of electronic journals at an academic institution and in the field of science and technology (which include agriculture) respectively and listed the positive characteristics of electronic journals as follows:

- Allow remote access;
- Can be used simultaneously by more than one patron;
- Provide timely access;
- Support different searching capabilities;
- Accommodate unique features (links to related items, reference linking);
- Save physical storage space;
- Can support multimedia information;
- Do not require physical processing (receiving and binding);
- Can be environmentally valuable; and
- Can be saved digitally.

Limitations to electronic journals are increasing traffic on the Internet, inadequate bandwidth, and network delay (Mounissamy & Swaroop Rani 2005, p. 204). According to Hunter (2007, pp. 120-121) it is not much cheaper to subscribe to electronic journals only. Libraries may receive a discount of 10%, but cannot regard the electronic format as a major savings exercise.

Several articles consulted regarding the format indicated that an electronic format is preferred by researchers (Galvin 2004; Hunter 2007; Sheeja 2010). A few articles that include agricultural researchers are mentioned below.

Kuruppu and Gruber (2006, p. 613) reported that agricultural and biological science students prefer electronic access to information to do their searches. It is convenient to download and print articles quickly, not needing to go to the library first. On the other hand, they also prefer to print articles that they want to read, because they found it difficult to read them on the computer screen.

According to the study done by Agboola (2010, p. 64) at three universities in Nigeria amongst undergraduate agricultural students, the students indicated a definite preference towards electronic resources instead of print resources. Nkomo (2009, p. 65) undertook a study at the University of Zululand and the Durban University of Technology to investigate the web information seeking behaviour of staff and students. The results showed that both the students and the academics preferred both print and electronic media when searching for information.

In the study by Niu et al. (2010, p. 875), academic researchers in natural science, engineering and medical science indicated that they prefer to search the electronic versions of resources above the print formats, which they access through the library or via open access. The reason in favour of electronic resources is the convenience, speed and the interactivity of Internet searching. For reading articles, they prefer both print and electronic formats. (Niu et al. 2010, p. 877). This shows that both mediums have its place and it depends on the researcher's situation. Interestingly enough is the fact that the researchers indicated that reading in electronic format was the least preferred method.

According to the literature consulted, both of these formats, printed copies as well as electronic copies, still have a place in the agricultural researchers' lives.

3.3.5 Importance of library instruction and information literacy

The Association of College and Research Libraries (ACRL) (2000, pp. 2 of 20) defines information literacy 'as a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information'. The definition is supported by Kinengyere (2007, p. 329) as she defines it as '… the ability to identify an information need, locate and access the required information, evaluate, organize and apply it to address the need in question'. 'Information literacy' is also referred to as 'information competency' (Kinengyere 2007, p. 329).

According to the ACRL an information literate person are equipped to:

- Determine the extent of information needed;
- Access the needed information effectively and efficiently;
- Evaluate information and its sources critically;
- Incorporate selected information into one's knowledge base;
- Use information effectively to accomplish a specific purpose; and
- Understand the economic, legal and social issues surrounding the use of information, and access and use information ethically and legally.

Kinengyere (2007, p. 329) explains that information literate people are able to:

- Know how to define a subject or area of investigation;
- Select appropriate terminology that expresses the concept under investigation;
- Formulate a search strategy that takes different sources into consideration as well as the ways in which information is organised;
- Analyse the data for value, relevancy, quality and suitability; and
- Turn it into knowledge.

The importance of library instruction can never be overemphasised. Researchers can save valuable time if they know where and how to search for information. Dulle et al. (2001, pp. 191-192) did a survey among researchers from 13 agricultural research stations in Tanzania and recommended patron education due to the on-going changes in retrieval systems. They found that a lack of patron education resulted in ineffective use of information resources. They also recommended that information search skills should be incorporated in the research methodology course at Masters' degree level to minimise problems of researchers in accessing information.

In their study of the information needs of academic scholars in agricultural and biological science, Kuruppu and Gruber (2006, p. 620) concluded that many scientists' information finding skills are not very good, although they consider themselves above average. Students spend a lot of time searching for information, but are very often frustrated by the lack of good results. Faculty members and students expressed the need for short instruction sessions that are presented frequently. They need subject related information and online help tools. Library e-mails also serve as an important tool for effective point-of-need assistance (Kuruppu & Gruber 2006, p. 621).

Other studies that support patron education and developing of information literacy skills are that of Fidzani (1998); Hundie (2003); Kavulya (2007) and Muller (2007). Fidzani reported on information seeking behaviour and use of information sources by

the graduate students of the University of Botswana. Respondents in this survey strongly agreed with library instruction on how to use information sources (Fidzani 1998, p. 336). Hundie (2003) describes the importance of information literacy skills in a world where information and technology grows very rapidly. He states 'the success and survival of many companies and individuals depend upon information literacy skills' (Hundie 2003, p. 561). Hundie (2003) is a librarian at the Botswana College of Agriculture. Kavulya's study concentrated on the information needs of libraries in the Sub-Saharan Africa and he emphasised the importance of information literacy skills in a digital environment (Kavulya 2007, p. 308).

Libraries in Uganda realised the importance of information literacy and developed some strategies to promote more effective use of their expensive e-resources (Kinengyere 2007, p. 331). They attended several workshops and training sessions for librarians, researchers, students, policy-makers, educators and extension workers where they were taught how to use the library as well as the e-resources available. Several advantages emerged out of this programmes, such as increased utilisation of e-resources, librarians and researchers working together to enhance e-resource utilisation. Students and researchers have also produced better research reports (Kinengyere 2007, p. 334, p. 339).

3.4 CONCLUSION

In this chapter a literature study was conducted and the most important points were discussed. These points include models of information seeking behaviour, which featured quite prominently in the literature. The models of Wilson, Dervin, Ellis and Kuhlthau were chosen and discussed because they correlate with the behaviour and needs of researchers. Several studies on information sources and library services were mentioned and, in line of this study, concentrated on agricultural researchers. Other points of importance were the preferred format of information as well as the issue of information literacy.

The literature study provided important background information, which brings us to the next issue, Chapter 4, where the competencies and skills of the librarians will be discussed.

CHAPTER 4

SKILLS AND COMPETENCIES OF LIBRARIANS

4.1 INTRODUCTION

In Chapter 3 the information needs and behaviour in agricultural context was explored and a literature study was conducted.

This chapter focuses on the competencies and skills of a librarian in a modern service-orientated environment. It is necessary for librarians to possess certain skills, which will assist them in rendering an effective service. As indicated in the problem statement in Chapter 1 (section 1.7), the rendering of effective services is very important and to do that, librarians need to have certain skills and competencies to fulfil this duty. The third research question is as follows:

'What competencies and skills do librarians need to effectively execute their role in such a research environment?'

The researcher did not focus solely on agricultural librarians, but on a more general overview of the topic. Skills and competencies apply to all librarians, irrespective of the nature of their library. The literature consulted did not indicate a clear difference between skills and competencies and therefore the terms are used simultaneously. For the purpose of this study, it is also not considered necessary.

The skills and competencies as identified in the literature is firstly summarised in Table 4.1, where after a discussion will follow of the skills and competencies as described by different authors.

4.2 SKILLS AND COMPETENCIES

Instead of feeling threatened about the electronic world, (Storey 2007, p. 489) it should be seen as an opportunity for librarians to expand their services and not regard it as a threat to their careers (Melchionda 2007, pp. 125-131). Competencies and services should be adapted to include electronic services and to use the Internet to their advantage. Librarians have to take a fresh look at the competencies and skills needed to execute their duties in the best possible way (Abels et al. 2003; Gosine-Boodoo 2006; Singh 2004). Roles are changing and electronic services open up a new field in every library (Margulies 2006; Pinfield 2001; Rao & Babu 2001). New strategies, decisions and

creativeness are needed in the digital world. Librarians play an important role in their organisations (Margulies 2006; Oswitch 1990; Van Niekerk 1988).

A literature study was carried out to ascertain which competencies and skills are important for librarians. The competencies and skills as identified in the literature consulted are summarised in Table 4.1 below. The table is arranged in alphabetical order according to the author or association. Authors categorise such skills and competencies in different ways, e.g. as traditional versus new, or professional versus personal. Where applicable such categorisation is indicated. It will, however, not be further pursued for purposes of this dissertation.

Table 4.1: The competencies and skills identified in the literature

Authors	Date	Competencies and skills
Abell	1998	*Categorisation: service provision, service development and strategic skills*. *Service provision*: subject knowledge, information retrieval, communication skills. *Service development*: resource management, organisation of knowledge, analysis, understanding of context. *Strategic skills*: cost control, refined communication skills, including influencing and negotiation and strategic analysis.
Abels, Jones, Latham, Magnoni and Marshall	2003	*Categorisation: professional and personal competencies*. *Professional competencies*: managing information organisations, managing information resources, managing information services, applying information tools and technologies. *Personal competencies*: communication skills, creativity, seeking opportunities, negotiation, networking, flexibility, creating partnerships and agreements, creating trust and respect, team approach, planning, balancing between work and personal obligations, recognition for self and others.
ASERL Education Committee	2007	*No categorisation.* Effective service rendering, co-operation and collaboration, understanding of a library within higher education, understanding needs of patrons, in-depth knowledge of information sources in all formats, commitment to librarianship.
Australian Library and Information Association	2012	*Categorisation: required knowledge, generic skills and attributes.* *Knowledge required of*: information environment, information seeking, information infrastructure, information organisation,

		information access, information services, sources and products, information literacy education, generation of knowledge. *Generic skills and attributes*: effective communication skills, adherence to professional ethical standards and social responsibility, project management skills, critical, reflective and creative thinking, problem-solving skills, business insight, ability to build partnerships and alliances, effective team relationship skills, self-management skills, a commitment to life-long learning, relevant IT and technology application skills and appropriate information literacy skills.
Fourie	2004	*No categorisation.* Information management, editing, information organisation, value addition, customer relationship management, general management, IT project management, budgeting, people management, political, business and financial skills, generic skills, IT skills and survival skills.
Freese and Freese-Brislin	1996	*Categorisation: traditional skills, IT skills, people skills and management skills.* *Traditional skills*: information retrieval and collection building, cataloguing and classification, indexing and abstracting and interlibrary loans. *IT skills*: online searching and the Internet. *People skills*: inside and outside the organisation. *Management skills*: personnel management, budgeting skills and marketing skills.
George, Stillwell and Warmkessel	2003	*No categorisation.* Communication, competence, personalisation, activity awareness and adaptability.
Gerolimos and Konsta	2008	*Categorisation: professional skills and general skills.* *Professional skills*: Process – management of convention materials, process – management of digital materials, IT skills, Administrative – organisational skills and education. *General skills*: Personal traits, interpersonal skills, experience and lifelong learning.
Nonthacumjane	2011	*Categorisation: personal skills, generic skills and discipline-specific knowledge.* *Personal skills*: analytical, creative, flexible, reflective, dealing with a range of patrons, detective-like, adaptable, responsive to others' needs, enthusiastic and self-motivated. *Generic skills*: information literacy, communication, critical thinking, teamwork, ethical conduct and social responsibility,

		problem solving and leadership. *Discipline-specific knowledge*: metadata, database development and management, patron needs, digital archiving and preservation, collection development and content management systems.
Ojedokun and Moahi	2005	*No categorisation.* Information retrieval and management, word-processing and desktop publishing, project management, information communication and presentation, marketing, public relations, strategic planning, web page design and maintenance, Internet, CD-ROM technology and library automation, portals and network management.
Olander	2010	*New skills.* Excellent social skills, communication skills, information management skills, IT skills, willingness to change and strategic competence.
Pinfield	2001	*Categorisation: traditional skills and new skills.* *Traditional skills*: liaison with patrons, enquiries, selection of materials and budgeting, cataloguing, classification, collection management, user education, production of guides and marketing. *New skills*: subject expertise, people skills, communication, technical or IT skills, presentation and teaching, financial management, analytical and evaluative skills, team-working and team-building, project management, flexibility, ability to learn fast and vision.
Rehman	2006	*Categorisation: information and knowledge management competencies, functional competencies, management competencies and service enhancement and user empowerment.* *Information and knowledge management competencies*: content management, digitisation and portal management. *Functional competencies*: corporate mindset, dealing with vendors, outsourcing capabilities and competitive intelligence. *Management competencies*: strategic planning and decision making, marketing and public relations, physical dimensions, financial strategies and budgeting as well as benchmarking and valuation. *Service enhancement and user empowerment*: customer focus and information literacy.

Sharp	2001	*Categorisation: traditional skills and new skills.* *Traditional skills*: information handling, training and facilitating, evaluation, customer concern, cataloguing and classification, indexing, enquiries and user education. *New skills*: management and interpersonal skills, electronic information environment, web page design, automated library management systems, information organisation and training.
Storey	2007	*Categorisation: professional skills and personal skills*. *Professional skills*: readers, global in perspective, understand importance of work, committed to free flow of information, open archiving, public relations and literacy training. *Personal skills*: outgoing personality, brave and persistent, quick-thinking and good communication skills, politically sharp and a combination of steadfastness and humility.
Tanloet and Tuamsuk	2011	*Categorisation: knowledge, skills and personal attributes.* *Knowledge*: foundation of professional knowledge, information resources, information and knowledge management, IT, library and information services, organisational management, research and patron studies and continuing education and lifelong learning. *Skills*: customer service, information resources management, IT, marketing, knowledge management, language and communication, team working, analytical problem solving and decision-making, planning and management, teaching and training and conceptual thinking. *Personal attributes*: leadership, service attitude, morals and professional ethics, achievement motivation, accountability, self-management and adjustability.
Webb, Gannon-Leary and Bent	2007	*No categorisation.* Structure of knowledge and information, information retrieval skills, understanding of patron behaviour, information management skills and continuous professional development.

4.3 LITERATURE STUDY

A literature study was carried out to determine what is regarded as important skills and competencies for librarians. The result is arranged alphabetically according to the authors' surname.

4.3.1 Abell (1998)

Abell (1998) sketches the background of the growing importance of considering the roles that information professionals can play in requirements of organisations in these days. She emphasises that the opportunities for librarians with an appropriate mix of traditional and information skills together with added business and organisational skills is still expanding (Abell 1998, p. 212). Traditional expertise can be applied in new roles very effectively, if librarians understand the objectives of applying these skills in new circumstances. Information skills are utilised to identify and acquire internal sources (information mapping); to structure and codify internal sources (cataloguing and classification); source and acquire external sources (resource and supply management); integrate internal and external sources (utilisation of IT platforms and applications) and to enable timely delivery of relevant, useable information (content, form and delivery) (Abell 1998, p. 213). According to Abell (1998, p. 213) opportunities go to those who recognise the application of their traditional information skills.

Three categories of skills and competencies are identified by a research study done by Task Force Pro Libra (TFPL), namely skills for service provision, skills in designing and supporting service development and strategic skills (Abell 1998, p. 214). In the first category, skills required are subject knowledge, information retrieval and communication skills. In the second category, skills required are resource management, organisation of knowledge, analysis and an understanding of context. The last category includes cost control, refined communication skills such as influencing and negotiation and strategic analysis.

4.3.2 Abels, Jones, Latham, Magnoni and Marshall (2003)

The Special Committee of the Special Libraries Association (SLA) prepared a document on competencies and skills for librarians, which has been widely used (Abels et al. 2003, pp. 1 of 17). They identified two types of competencies, which are ‘professional competencies’ and ‘personal competencies’. These competencies are explained in more detail in the following paragraphs.

4.3.2.1 Professional competencies

Professional competencies refer to the practitioners’ knowledge of information sources, access, technology and management and their ability to use this knowledge as a basis to provide a high quality of information services (Abels et al. 2003, pp. 2 of 17). Four major competencies are identified in this group, such as managing libraries, managing library information sources, managing library information services and applying information tools and technologies (Abels et al. 2003, pp. 2 of 17).

Librarians need professional competencies to fulfil the following library management functions within the parent organisation:

- To align the library with the strategic direction of the parent organisation;
- To assess and communicate the value of the library to senior management;
- To establish effective management, operational and financial management processes;
- To contribute positively to senior management strategies and decisions in regard to information applications, tools, technologies and policies;
- To build and lead an effective library team;
- To market information services and products in various ways;
- To gather the best available evidence to support decisions regarding new products and services, the modification of current services, or the elimination of services; and
- To advise the organisation on copyright and intellectual property issues (Abels et al. 2003, pp. 5 of 17).

Important functions of managing information resources are to:

- Manage the full cycle of information from its acquisition, for example organising, categorising, cataloguing, classifying and dissemination;
- Build a good collection of information resources based on the patrons' information needs;
- Demonstrate expert knowledge of the content and format of information resources, as well as how to evaluate, select and filter them;
- Negotiate the purchase and licensing of information products and services;
- Provide access to the best available externally published and internally created information sources; and
- Develop information policies for the organisation regarding above mentioned information sources (Abels et al. 2003, pp. 7 of 17).

Important functions of managing information services are to:

- Develop and maintain a cost-effective, client-valued information service aligned with the strategic direction of the organisation;
- Conduct market research of the information behaviour and problems of the patrons to identify concepts for new or enhanced solutions;
- Analyse and synthesise information into accurate answers for the patrons and ensure that they have the ability to apply them;
- Develop and apply appropriate metrics to measure the quality and value of information offered; and

- Employ evidence-based management to demonstrate the value of the information services and sources (Abels et al. 2003, pp. 9 of 17).

To apply information tools and techniques, the librarian needs to:

- Assess, select and apply current and new information tools and develop information access and delivery solutions;
- Apply expertise in databases, indexing, metadata and information analysis to improve information retrieval and use;
- Protect the information privacy of patrons; and
- Maintain awareness of emerging technologies that may become important tools of future information resources (Abels et al. 2003, pp. 11 of 17).

4.3.2.2 Personal competencies

Personal competencies represent a set of skills, attitudes and values that enable practitioners to work effectively and to contribute positively to their organisations (Abels et al. 2003, pp. 2 of 17). Personal competencies are outlined as that every librarian should be able to:

- Seek challenges and take advantage of new opportunities;
- See the bigger picture;
- Communicate effectively;
- Present ideas clearly and negotiate confidently and persuasively;
- Create partnerships and agreements;
- Build an environment of trust and mutual respect;
- Employ a team approach;
- Take risks and show courage and tenacity when faced with the opposition;
- Plan, prioritise and focus on what is critical;
- Demonstrate career planning;
- Think creatively;
- Recognise the value of networking and personal career planning;
- Balance work, family and community obligations;
- Remain flexible and positive during this time of continuous change; and
- Celebrate achievements for self and others (Abels et al. 2003, pp. 12-16 of 17).

Professional and personal competencies are essential for every librarian. Through these competencies, librarians understand the importance of developing and sharing their knowledge, which is accomplished through networks, conferences, publications and collaborative agreements. They also continue to learn about information products, services and management practices during their careers. Through these competencies,

the librarians also commit themselves to professional excellence and ethics, as well as to the values and principles to the profession (Abels et al. 2003, pp. 4 of 17).

4.3.3 The Association of Southeastern Research Libraries (ASERL) (2001)

The Association of Southeastern Research Libraries established an Education Committee to address librarians' educational needs in support of research libraries (ASERL 2001, pp. 2 of 12). The Committee developed competencies with the academic research library in mind. These competencies are discussed in the next few paragraphs.

This article emphasised the role of the research library in an ever-changing technological environment and the challenge to balance the traditional collection and service model with resource needs for new initiatives (ASERL 2001, pp. 4 of 12). The accent is placed on the services provided by the research librarian regardless of the physical location of the collection. The traditional role of maintaining and preserving library collections are still regarded as important as the new role of creating new information systems for managing, disseminating and preserving information irrespective of format (ASERL 2001, pp. 5-6 of 12).

The Committee identified the following qualities of the research librarian, namely intellectual curiosity, flexibility, adaptability, persistence, the ability to be enterprising, excellent communication skills and a commitment to lifelong learning and personal career development (ASERL 2001, pp. 7 of 12).

The following competencies were established by the Education Committee (ASERL 2001, pp. 7-8 of 12):

- Developing and managing effective services that meet user needs and support the research library's mission;
- Supporting co-operation and collaboration to enhance service;
- Understanding the library within the context of higher education and the needs of researchers;
- Knowing the structure, organisation, creation, management, dissemination, use and preservation of information sources in all formats; and
- Committing to the values and principles of librarianship.

4.3.4 Australian Library and Information Association (2013)

The Australian Library and Information Association (ALIA) divide skills and competencies into two categories, namely 'core knowledge and skills' and 'generic skills and attributes' (ALIA 2013, pp. 2-3). The first category includes the following:

4.3.4.1 Core knowledge and skills

- Knowledge of the broad context of the information environment

Librarians should be able to understand and interpret the context in which information is originated, stored, organised, retrieved, disseminated and used; to understand the relevant ethical, legal and policy issues; and to envision future directions of the library and negotiate alliances for the library and information sector (ALIA 2013, pp. 1 of 3).

- Information seeking

Librarians should understand and investigate how information is sought and utilised. They should be able to identify and investigate the information needs and information behaviour of the patrons (ALIA 2013, pp. 1 of 3).

- Information architecture

Librarians need the ability to understand the importance of information architecture to determine the structure, design and flow of information; and to plan and facilitate appropriate resource management (ALIA 2013, pp. 2 of 3).

- Information organisation and access

Librarians should be able to facilitate information access and use through systematic and patron-centred description, categorisation, storage, preservation and retrieval. Librarians need to provide and promote free and reasonable access to information and client services; and need the ability to facilitate the acquisition, and licensing of information in a variety of formats (ALIA 2013, pp. 2 of 3).

- Information services, sources and products

Librarians should be able to design and deliver customised information services and products; to evaluate the effectiveness of library services, facilities and products; to market library and information services; to evaluate services, sources and products; to determine their relevance to the information needs of the patrons; and to use research skills to provide suitable information to patrons (ALIA 2013, pp. 2 of 3).

- Information management

Librarians should be able to forecast, plan, facilitate and evaluate appropriate resource management to library services; identify ethical and legal aspects regarding the distribution of information; and manage the physical and digital assets under the control of the library, including collection building, preservation and capacity planning (ALIA 2013, pp. 2 of 3).

- Generation of knowledge

Librarians need the ability to gather and analyse data and disseminate the findings to advance library and information science theory and its application to the provision of

information services. They should also demonstrate a commitment to the improvement of professional practice through a culture of research and evidence-based information practice. Librarians should be able to expand knowledge according to the state of research in information behaviour and continue lifelong learning through a professional development scheme (ALIA 2013, pp. 2 of 3).

4.3.4.2 Generic skills and attributes

The 'generic skills and attributes' include effective communication skills; professional ethical standards and social responsibility; ability to fulfil clients' needs; project management skills; critical, reflective and creative thinking skills; problem-solving skills; marketing; accounting; human resource skills; ability to build partnerships and alliances; effective team relationship skills; self management skills; a commitment to life-long learning; relevant IT and technology application skills; general knowledge; supervisory skills and appropriate information literacy skills (ALIA 2013, pp. 2 of 3).

4.3.5 Fourie (2004)

According to Fourie (2004, p. 62) librarians need to function in a variety of larger environments, such as being part of a global world shaped by electronic networks and IT. They have to earn their place alongside cybrarians, Web-masters and knowledge managers and also attend to the needs of the digital divide, the information poor and the illiterate. Amidst all the changes, librarians must find a way to secure their future as information professionals and find a balance between traditional roles and new roles. Fourie (2004, pp. 67-68) identified a few broad areas for potential roles, namely:

- Cultural role;
- Teaching role;
- Provision of access to information;
- Space provision;
- Negotiation on behalf of the patrons;
- Publishing role;
- Advising role;
- Project management;
- Information organisation;
- Archival management;
- Information retrieval and researching;
- Environmental scanning;
- Active identification of new niche markets; and
- Action research.

Skills that are needed for the claiming of new roles include information management, editing, information organisation, value addition, customer relationship management, general management, IT project management, budgeting, people management, political, business and financial skills (Fourie 2004, p. 69). Generic skills include creativity, risk-taking abilities and self-knowledge. IT skills are also very important and self-explanatory. To be prepared to claim new roles, librarians also need survival skills to do environmental scanning and rapid decision-making; to analyse the professional domain and where it is heading; to assess the value of professional products; to employ time management; to work collaboratively; to study independently; to think creatively; and to assess own strengths, weaknesses and progress in learning (Fourie 2004, p. 69).

4.3.6 Freese and Freese-Brislin (1996)

According to Freese and Freese-Brislin (1996, p. 10) special libraries differ from public and academic environments because of the different environment as well as the fact that they have to adapt to the larger organisational systems. They explained the traditional functions in the library as information retrieval and collection building; cataloguing and classification; indexing and abstracting; and interlibrary loans (Freese & Freese-Brislin 1996, pp. 11-12). Librarians need skills to effectively retrieve information for their patrons; to build and maintain good relationships with subscription agents; and to monitor their collections to be able to identify weaknesses (Freese & Freese-Brislin 1996, p. 11). Indexing and abstracting skills are very important for librarians as this helps to reduce the time someone spends on information retrieval and selection. To do interlibrary loans, the librarians should be trained to use the standard procedures, such as Sabinet's interlending system (applicable to the South African context) (Freese & Freese-Brislin 1996, p. 12).

New roles emerged for librarians with the possibilities offered by IT, which has developed at an incredible rate (Freese & Freese-Brislin 1996, p. 12). New roles include online searching using different online databases as well as searching and sifting information on the Internet. The librarian needs skills in using online databases as they all have different search interfaces and features. The librarian needs to train the end user in using the Internet, as well as methods to search online, information organisation, and organising personal stores of information (Freese & Freese-Brislin 1996, p. 13).

Another very important skill is people skills – both inside and outside the organisation (Freese & Freese-Brislin 1996, p. 13). Inside the organisation it is necessary to establish relationships of trust with the patrons and to conduct effective reference interviews to establish exactly what information the researcher needs. It promotes trust in the librarian if the researcher gets exactly what he wants. People skills outside the organisation include commercialising and marketing skills, as well as the ability to network through

informal and formal contact with colleagues and professional bodies (Freese & Freese-Brislin 1996, p. 13).

Management skills include personnel management, budgeting skills and marketing skills (Freese & Freese-Brislin 1996, p. 14). Librarians/managers should handle personnel with sensitivity and vision. Librarians should be knowledgeable regarding the organisation's goals as this determine where the funds will be allocated and they should develop plans to support their goals. Funds are rarely enough; therefore librarians need practical knowledge of financial principles, including zero budgeting, capital expenditure and cutbacks (Freese & Freese-Brislin 1996, p. 14).

Librarians in a special library need specific marketing skills in order to justify their existence to patrons who do not use the library if the services are not made invaluable to them (Freese & Freese-Brislin 1996, p. 14). The mission of the library has to be in line with the parent organisation and the librarian needs the skills to sell itself to the management.

4.3.7 George, Stillwell and Warmkessel (2003)

George, Stillwell and Warmkessel (2003) conducted a study at libraries of three academic institutions in the USA. Their investigation was inspired by a study done by two anthropologists, Bonnie Nardi and Vicky O'Day, involving complex human interactions in communication. George, Stillwell and Warmkessel (2003) interviewed librarians, faculty members and students and identified five characteristics that combined both humanity and intelligence. The five characteristics are communication, competence, personalisation, activity awareness and adaptability (George, Stillwell & Warmkessel 2003, p. 78).

Communication is regarded as a crucial skill in the library environment as the librarian needs to extract information from the patrons to fulfil their information requests. The librarian must learn what the patron really wants (George, Stillwell & Warmkessel 2003, p. 78). The librarians were considered as **competent** as they are able to design the search, identify the information sources and decide which search terms to use (George, Stillwell & Warmkessel 2003, p. 78). **Personalisation** entails the refining of the patron's goal, creating a profile and adapting the search strategy to ensure that the user gets what he really wants and not what he says he wants (George, Stillwell & Warmkessel 2003, p. 78).

Activity awareness means putting user's information needs into a broader context and to provide a knowledge base. **Adaptability** is the fifth skill identified and it demonstrates how librarians should be able to adjust strategies in response to changes and to continually update knowledge (George, Stillwell & Warmkessel 2003, p. 78).

4.3.8 Gerolimos and Konsta (2008)

Gerolimos and Konsta (2008, p. 694) studied a total of 200 job advertisements from the UK, Canada, Australia and the USA to investigate the qualifications and skills requested by libraries. Thirty-eight different skills and qualifications were identified in the job advertisements (Gerolimos & Konsta 2008, p. 695). They divided the skills into two major categories, namely professional skills and general (or social) skills (Gerolimos & Konsta, 2008, p. 696). The professional skills are divided into five groups and the general skills are divided into four groups (Gerolimos & Konsta 2008, p. 696). The two groups are discussed in the next few paragraphs.

4.3.8.1 Professional skills

According to Gerolimos and Konsta (2008, p. 696) the professional skills are interwoven with the working practices of the librarian, the use of professional standards and the daily activities of the librarian regarding technical services. The professional skills groups are further expanded as follows, indicating the skills needed for each group:

- Process – management of conventional materials

Librarians need skills in the management of conventional materials, such as automated library systems; collection development; collection management; experience in selecting, acquiring and processing conventional material; and serials collection management.

- Process – management of digital materials

Librarians need skills in the management of digital materials, such as the use of metadata tools; design and management of databases; evaluation of internet informational materials, sources and services; collection development; use of multimedia; digitalisation; and electronic publishing.

- IT skills

Librarians need IT skills to deal with markup languages; design, creation and maintenance of web pages; technical knowledge in computers; use of software applications; distance education software; programming languages; networks; and ability to compare software, hardware and technologies.

- Administrative and organisational skills

Librarians need administrative and organisational skills to fulfil duties such as library facilities management; financial resources management; human resources management and performance evaluation; evaluation of library services; interviewing skills; marketing; project management; and understanding organisational structure.

- Education

Librarians need educational skills, such as a degree in Library or Information Science; participation in conferences and seminars; participation in library associations and organisations; user education; typing; and foreign languages (Gerolimos & Konsta 2008, p. 696).

4.3.8.2 General skills

The general (or social) skills group are indicated as follows and include the skills needed for each group:

- Personal skills

Personal skills that librarians need are individual talents; critical thinking skills; ability to pay attention to detail; problem solving skills; self-marketing skills; ethical standards; and business skills.

- Interpersonal skills

The interpersonal skills required for librarians include the ability to work in a team; communications skills; ability to work alone; understanding patron demands and information needs; leadership; service orientation; and skills in participation and collaboration such as required for the development of library consortia.

- Experience

The work experience of librarians is very important and includes reference experience; administration experience; and insight in transferring traditional operations in an online environment.

- Lifelong learning and continuing education

In a changing environment it is important for librarians to develop skills in planning their personal career; the ability to learn constantly (i.e. life-long learning); enhancing their knowledge of current developments in LIS; as well as regarding current developments in IT (Gerolimos & Konsta 2008, p. 696).

Gerolimos and Konsta (2008, p. 697) conclude that although librarians face challenges for new and emerging skills, it is extremely important that they should be able to adapt existing skills and remain flexible in the ever-changing environment.

4.3.9 Nonthacumjane (2011)

Nonthacumjane (2011, p. 283) studied the literature over a fourteen year period to review the skills and competencies of library professionals working in a digital era. The

skills and competencies identified were classified into three categories, namely personal skills, generic skills and discipline-specific knowledge (Nonthacumjane 2011, p. 283).

Personal skills include skills such as being analytical, creative, flexible, reflective, able to deal with a range of patrons, detective-like, adaptable, responsive to others' needs, enthusiastic and self-motivated (Nonthacumjane 2011, p. 283). **Generic skills** include information literacy, communication, critical thinking, teamwork, ethics and social responsibility, problem solving and leadership (Nonthacumjane 2011, p. 284). **Discipline-specific knowledge** includes metadata, database development and management, patron needs, digital archiving and preservation, collection development and content management systems (Nonthacumjane 2011, p. 284).

Digitisation brought many changes to libraries regarding technological aspects, patron and learning behaviour and also social aspects – all of which have major impacts on the roles of librarians and the skills and competencies needed (Nonthacumjane 2011, p. 286).

4.3.10 Ojedokun and Moahi (2005)

A study was done at the University of Botswana among Masters Library and Information Science graduates and four major employers of the graduates (Ojedokun & Moahi 2005, p. 133). The graduates were asked to identify skills required for an emerging market for library and information science graduates in Botswana. The skills that they identified were information retrieval and management skills; word-processing and desktop publishing skills; project management skills; information communication and presentation skills; marketing skills; public relation skills; strategic planning skills; as well as web page design and maintenance skills (Ojedokun & Moahi 2005, pp. 135-136). The employers were asked about the influence of IT on their organisations and what skills they require from their information professionals. The results showed that they value information professionals with a profound understanding of information handling using IT and knowledge about the Internet, CD-ROM technology and library automation (Ojedokun & Moahi 2005, p. 137). They also added information retrieval and management skills, word-processing and desktop publishing skills, information communication and presentation skills and web page design and maintenance skills. Other skills required include creation and maintenance of portals, network management skills, technical skills to maintain and troubleshoot IT equipment and systems as well as knowledge of various software and its uses (Ojedokun & Moahi 2005, p. 137).

4.3.11 Olander (2010)

Olander (2010, pp. 1 of 5) mentioned changes in the library and information services arena due to the explosive development in IT. The skills of LIS students today should

also be relevant in 2040 if students expect a professional career of 30-35 years after completing their degrees (Olander 2010, pp. 1 of 5). This highlights the need of continuous professional education in addition to a basic degree.

Olander identified six areas of competence that are necessary for the new arena of library and information services, of which the most important one is excellent **social skills** (Olander 2010, pp. 2 of 5). Good teamwork with colleagues is required for successful service development and social skills are very important when information services are organised for project-oriented work (Olander 2010, pp. 2 of 5). The second area identified is **communication**, which is important to develop interactive communication with patrons and to keep up-to-date with new technologies. **Information management skills** will always be important in order to meet with the patrons' needs. The fourth area is excellent **IT skills** to enable librarians to continuously learn new technologies and make them professionally useful (Olander 2010, pp. 2 of 5).

The fifth area is **openness to change** as the rate of change is not going to slow down. The sixth area is **strategic competence** to apply a process-oriented view on the professional activities (Olander 2010, pp. 3 of 5). To stay successful means that the librarian understands the goals, objectives and future development of the institution in which it functions (Olander 2010, pp. 3 of 5).

The organisation's vision and objectives will indicate what kind of librarians is needed and which competencies should be developed (Olander 2010, pp. 4 of 5). In addition to this it is very important that librarians should keep themselves updated throughout their professional careers (Olander 2010, pp. 5 of 5).

4.3.12 Pinfield (2001)

Pinfield (2001) described the changing role of the subject librarian in the UK. He argued that subject librarians still have an important role to play in a modern academic library and that their traditional role can successfully be extended in an electronic environment if they have the necessary skills (Pinfield 2001, p. 33). The traditional role include liaison with patrons; enquiry work; selection of material and the management of the materials budget; cataloguing and classification; managing collections; patron education; production of guides and publicity; as well as wider responsibilities, such as functional and managerial responsibilities (Pinfield 2001, p. 33). Changes into the new role include functions, such as more emphasis on liaison with patrons; advocacy of the collections; new roles; handling of enquiries in different ways; such as through electronic mail; working with technical staff; selection of e-resources; more information skills training; organising the information landscape; involvement in educational technology and learning environments team working; and project working (Pinfield 2001, p. 33).

These roles imply new or newly adapted skills for subject librarians besides the traditional skills (Pinfield 2001, p. 37). It requires subject expertise; people skills; communication skills; technical or IT skills; presentation and teaching skills; financial management skills; analytical and evaluative skills; team-working and team-building skills; project management skills; flexibility; ability to learn fast; and vision (Pinfield 2001, p. 33).

4.2.13 Rehman (2006)

Rehman (2006, p. 27) discussed the changes in the environment of library and information organisations during the last twenty years. Information professionals had to adopt new roles in the construction of databases, information systems, digitisation, creation of virtual libraries, metadata as well as the development of intranets, extranets and portals. These new roles required new skills in information entrepreneurship; architecture; human-machine interfaces; connectivity; data warehousing; as well as information packaging and delivery (Rehman 2006, p. 27). Knowledge management has played an increasingly important role during the last fifteen years and presents a unique opportunity for library professionals (Rehman 2006, p. 28).

Competencies are listed as:

- Information management and knowledge management competencies;
- Functional competencies;
- Management competencies; and
- Competencies for service enhancement and patron empowerment (Rehman 2006, pp. 28-31).

Information management and knowledge management competencies are identified as content management, digitisation and portal management (Rehman 2006, p. 29).

The corporate world has seen a major transformation in the content it has been dealing with. Digital and virtual libraries are natural outcomes of digitisation and networking. Digitisation has changed information resource management in organisations with the emphasis on archiving systems. Competencies needed are related to imaging, archiving, databases and organisation through data/text mining (Rehman 2006, p. 29). Librarians also need to be alert to copyright and licensing issues. Organisations need to access data from the Internet, intranets and other electronic resources in a cost-effective way. Portals provide an effective way for content management and delivery. The software offers push-pull technology, which transmits information to patrons through interfaces. They integrate content management, business intelligence and data warehouse information, and package applications that target their content for a particular industry (Rehman 2006, p. 29).

Functional competencies are listed as competencies in the corporate mindset, dealing with vendors, outsourcing capabilities and competitive intelligence (Rehman 2006, pp. 29-30).

Librarians need the competency to work and adapt in a corporate environment, to have a good knowledge of their organisation and be able to work as team members. Vendors are an integral part of libraries and libraries have to deal with the issues of pricing, licensing and copyright (Rehman 2006, p. 30). Librarians need the competence to outsource certain activities regarding a number of technical processes, content deployment and maintenance of IT (Rehman 2006, p. 30). Competencies in competitive intelligence are also very important as librarians need to contribute meaningfully towards their organisations. Competencies include, among others, identifying competitors, selecting criteria to benchmark operations against competitors, data collection and analysis, conducting own information audits, and the ability to communicate results to management (Rehman 2006, p. 30).

Management competencies are divided into strategic planning and decision making, marketing and public relations, physical dimensions, financial strategies and budgeting as well as benchmarking and valuation (Rehman 2006, pp. 30-31). Librarians need to be able to conduct strategic planning, solve problems, measure, and interpret value in an appropriate manner. All actions must be in alignment of the parent organisation. Competencies are needed for marketing and public relations to create a positive image regarding their role, products and service (Rehman 2006, p. 31). Electronic resources, digitisation of internal documents, connectivity with systems and patrons, patron preferences and financial pressures to cut down on expenses have an impact on the physical dimensions of the library.

Librarians need:

- The competency to cope with the challenge of diminishing spaces;
- Financial and budgeting competencies in order to handle budget restraints, rising costs and growing demands – all of which complicate the management of a library; and
- The ability to measure the value of their products and services to prove return on investment and they need the competencies to use available tools, methods and strategies (Rehman 2006, p. 31).

According to Rehman (2006, p. 31) competencies for service enhancement and patron empowerment can be seen from a fresh perspective by highlighting two factors, namely customer focus and information literacy. A new focus is needed because of the changing environment of the patron. Factors to keep in mind is the location of the patron, enhanced capabilities of the patron, new modes of interfaces, access modes, networked

functioning and desktop delivery (Rehman 2006, p. 31). Patrons are not necessarily located on one campus and therefore remote access to information sources, services and products is needed. Customer focus has changed from the traditional customer to the virtual customer (Rehman 2006, p. 32). Patron's skills should be properly developed to retrieve information from needed sources, which means that information professionals should develop strategies to improve information literacy among their patrons.

4.3.14 Sharp (2001)

In her article on Internet librarianship Sharp (2001) focused on the traditional role in the new environment. She explained that the Internet provides patrons with access to a vast amount of resources and also changes the work of the information professionals (Sharp 2001, p. 78). The traditional core skills, such as information handling skills, training and facilitating skills, evaluation skills and concern for the customer are still very important (Sharp 2001, p. 78). Traditional skills also cover cataloguing and classification, indexing, enquiry work and patron education. Librarians can use traditional skills effectively to improve skills in navigating the Internet.

According to Sharp (2001, p. 79) the librarian of the future should be equipped with a range of personal as well as transferable skills to manage the changing environment. Management and interpersonal skills are important to make librarians more effective managers of networked resources and services. Librarians should change and adapt to the new electronic information environment and learn about their strengths and weaknesses (Sharp 2001, p. 79). Skills in creating web pages, choosing automated library management systems and information organisation are necessary in the new era. Librarians should educate patrons to find the information they need and then provide them with the tools to access the resources for their personal needs (Sharp 2001, p. 79).

4.3.15 Storey (2007)

Storey (2007, p. 495) identified professional characteristics and personal characteristics for librarians to survive in the years to come. Professional characteristics include that librarians should be readers themselves and be global in perspective to be able to benchmark their libraries against similar other libraries. They need to realise the importance of their work, be committed to the free flow of information and open archiving, experts in public relations and have the knowledge to train the patrons to be information literate (Storey 2007, p. 496). Personal skills include an outgoing personality, they need to be brave and persistent, quick-thinking with good communication skills, have a political sense that is sharp to survive in senior policy committees and lastly, they need a combination of steadfastness and humility (Storey 2007, p. 497).

4.3.16 Tanloet and Tuamsuk (2011)

Tanloet and Tuamsuk (2011) reported on an investigation to identify the core competencies of the information professionals of Thai university libraries. Three groups of core competencies were explored, namely knowledge competencies, skills competencies and personal attributes (Tanloet & Tuamsuk 2011, p. 125).

Knowledge competencies include the foundation of professional knowledge; information resources; information and knowledge management; IT; library and information services; organisational management; research and patron studies; as well as continuing education and lifelong learning (Tanloet & Tuamsuk 2011, p. 126).

Skills competencies include customer service skills; information resources management skills; IT skills; marketing skills; knowledge management skills; language and communication skills; team working skills; analytical problem solving and decision-making skills; planning and management skills; teaching and training skills; as well as conceptual thinking skills (Tanloet & Tuamsuk 2011, p. 127).

Personal attributes include leadership; service attitude; morals and professional ethics; achievement motivation; accountability; self-management and adjustability (Tanloet & Tuamsuk 2011, p. 128).

The study stressed the fact that libraries and librarians will have to change and adjust to the changing roles in libraries (Tanloet & Tuamsuk 2011, p. 124). They should take responsibility in management in order to respond to decision-making and establish the organisations' vision and policies (Tanloet & Tuamsuk 2011, p. 125). Various issues stood out as important, such as marketing skills, ethics and morality, leadership, competency in administration and service orientated librarians (Tanloet & Tuamsuk 2011, p. 127).

4.3.17 Webb, Gannon-Leary and Bent (2007)

Webb, Gannon-Leary and Bent (2007, p. 214) discussed several skills that librarians need to deliver a professional service to researchers. They are indicated as follows:

- Understanding the structure of knowledge and information within disciplines

Librarians must know how knowledge is communicated in the disciplines with which they work. This knowledge provides understanding of the importance of different publication forms, key journals and publishers which leads to more effective support to the patrons. The knowledge can be used to develop library collections and to create learning resources and teaching materials (Webb, Gannon-Leary & Bent 2007, pp. 214-215).

- Information retrieval skills

Librarians should be competent, flexible and effective at browsing and searching information retrieval systems; have the ability to use various retrieval techniques; and to communicate its effective use to patrons (Webb, Gannon-Leary & Bent 2007, p. 215).

- An understanding of patron behaviour

Librarians should know how patrons search for information. Patron knowledge will help identifying their search problems and to give advice to improve their techniques (Webb, Gannon-Leary & Bent 2007, p. 215).

- Information management skills

Librarians should be able to assist patrons in compiling bibliographies; to give advice of referencing conventions; the use of reference management software; and the creation of metadata. They should also play a leading role in the development and management of institutional repositories and open access publishing. Librarians must understand the importance of ethical approaches in information management, plagiarism detection software, compliance and records management (Webb, Gannon-Leary & Bent 2007, p. 216).

- Continuing professional development

It is also important for librarians to commit to learning and developing by ongoing reflection of work and by obtaining additional qualifications (Webb, Gannon-Leary & Bent 2007, p. 216).

4.4 SKILLS AND COMPETENCIES: SUMMARY

The skills and competencies as found in the literature is summarised in Table 4.2 below and are arranged according to the Special Libraries Association's categories, namely professional competencies and personal competencies (Abels et al. 2003, pp. 2 of 17).

Table 4.2: Skills and competencies

PROFESSIONAL COMPETENCIES	
Skills	**Functions**
Traditional skills	Information retrieval Collection development Cataloguing and classification Interlibrary loans Indexing and abstracting Patron education Preservation

IT skills	Online searching Internet Information literacy skills IT project management Web page design and maintenance Portals and network Library automation Digital archiving and preservation
Management skills	Strategic planning and decision making Personnel management Marketing and public relations Benchmarking and valuation Physical dimensions Problem-solving Business knowledge Leadership skills Ethics and social responsibility
Financial skills	Budgeting Financial strategies
Services and customers	Subject knowledge Patrons' needs Social skills
Information environment	Information seeking Information infrastructure Information management
PERSONAL COMPETENCIES	
Communication skills	Presentation Negotiation Teaching
People skills	In- and outside the organisation Team relationship skills Customer relationships
Survival skills	Environmental scanning Assess value of professional products Time management Collaboration Career planning Independent studies / life-long learning Creative thinking Assess own strengths and weaknesses Self-management skills

	Partnerships and cooperation Flexible and positive Seeks challenges and opportunities Willingness to change / adjustability Self-motivation Enthusiasm

4.5 CONCLUSION

To pinpoint a model for an agricultural library, it is important to identify which skills and competencies are necessary for the librarian to survive and to recognise new opportunities. Librarians should realise that they are able to apply their traditional skills in new roles very effectively. Abell (1988, p. 214) concluded by stating:

> 'Perhaps if the information profession had more confidence in its fundamental skills and concentrated on developing knowledge of their value we would move into the 21st century as a core rather than support profession'.

There are many articles available in the literature on the topic of skills and competencies; not all could be included in this study. It would therefore be worthwhile in the future to do a more complete investigation into this matter. For purposes of this study the essence of the knowledge, skills and attitude noted in this Chapter will be incorporated in the Framework suggested in Chapter 7. However, due to the magnitude of issues noted here, it would be worthwhile to encourage agricultural and other librarians to revisit the knowledge, skills and attitude required to provide services of excellence in dynamic and evolving work environments.

In Chapter 5 the research methodology will be discussed, which include both qualitative methods and quantitative methods of research.

CHAPTER 5

RESEARCH METHODOLOGY

5.1 INTRODUCTION

In this chapter the research methodology will be discussed. This entails the methods used for data collection, sampling techniques and data interpretation methods. As mentioned in Chapter 1, data was collected using questionnaires and interviews. Both quantitative and qualitative data were collected in the study. Quantitative data was collected by means of questionnaires and qualitative data through interviews. In recent information behaviour studies, it became common practice to use qualitative methods in conjunction with quantitative research methods (Chowdhury et al. 2008, p. 292; Kuruppu & Gruber 2006, p. 620). Leedy and Ormrod (2005, p. 97) concluded that such a mixed-method design – where both qualitative and quantitative methods are used – provides better understanding of the specific phenomenon that is being studied. According to them the mixed-method design is very useful where human behaviour is observed (Leedy & Ormrod 2005, p. 97).

The concepts, research and research methodologies will be clarified and explained. Attention will be given to the two major types of research, namely basic research and applied research. Thereafter the research methodologies will be described with specific reference to quantitative and qualitative research methods.

5.2 CONCEPT OF RESEARCH

Leedy and Ormrod (2005, p. 1) described 'research' as a word that has many meanings. They were of opinion that the word 'research' is used when people actually mean that they are busy with information gathering, library skills, documentation, self-enlightment, etc. Leedy and Ormrod (2005, p. 2) defined research as: '…a systematic process of collecting, analysing, and interpreting information (data) in order to increase our understanding of a phenomenon about which we are interested or concerned'. The *Collins English Dictionary* millennium edition (Sinclair ed. 1998, p. 1309) describes research as a 'systematic investigation to establish facts or principles or to collect information on a subject'. Research is defined by Mouly (1978, p. 12) as follows: 'Research is best conceived as the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis, and interpretation of data'. This study is focused on providing an effective service to the researchers and other patrons of ARC-SGI's library; therefore it is needed to have a better understanding of the information needs of the patrons and to adapt the services and resources of the

library accordingly. To find an answer it was necessary to collect data through appropriate means.

5.2.1 Types of research

There are two major types of research, namely basic and applied research, which will be discussed briefly in the next two sections.

5.2.1.1 Basic research

According to Powell and Connaway (2004, p. 2) basic research primarily refers to the obtaining of new knowledge about a certain subject or problem and is only indirectly involved with how the newly acquired knowledge will be applied to specific, practical and real problems. Basic research is also known as pure, theoretical or scientific research (Powell & Connaway 2004, p. 2) and enhances the researcher's theoretical knowledge about a particular subject (Leedy & Ormrod 2005, p. 44). Bogdan and Biklen (2007, p. 219) stated that basic research is concerned with adding to one's general knowledge without concern with the immediate application of the new knowledge. Examples of basic research are found in Del Rio et al. (2002) and the work of Pelzer and Wiese (2003).

5.2.1.2 Applied research

Applied research is the second major type of research and it incorporates a range of research techniques, such as system analysis and operations research (Powell & Connaway 2004, p. 2). Applied research is aimed at the solving of problems in actual situations. Leedy and Ormrod (2005, p. 44) explained applied research as research that is important to current practices, procedures and policies. When applied research addresses a problem in one's own work environment with the purpose of solving a specific problem, it is known as action research (Leedy & Ormrod 2005, p. 44). Leedy and Ormrod (2005, p. 108) defined action research as 'a type of applied research that focuses on finding a solution to a local problem in a local setting'. Wilson and Streatfield (1981) added that research in the information science field is usually applied research. Examples of action research are that of Sharp (2006) and Somerville and Brown-Sica (2011).

Powell and Connaway (2004, p. 54) conveyed the opinions of other researchers who emphasise the value of using both basic and applied research during a study. The theoretical knowledge of basic research is used in conjunction with formal techniques to investigate the real world phenomena.

This study used both basic and applied research. Through the literature study the researcher gained more knowledge on the subject involved. This includes knowledge about services and resources of libraries and agricultural libraries worldwide. The

researcher also learned about the information needs and information seeking behaviour of agricultural researchers, and the skills and competencies that librarians need to provide an effective service to agricultural researchers.

The knowledge that is gained through the literature is applied to set up an investigation into the information seeking behaviour of the researchers and other patrons of the library of ARC-SGI. The investigation was conducted by means of quantitative and qualitative methodologies and more specifically through questionnaires and interviews. The researcher aimed to learn more about the patrons' information needs and to make suggestions for the adaptation of the services and resources of the library accordingly.

5.2.2 Research tools

The researcher needed research tools to carry out the research in every discipline and situation (Leedy & Ormrod 2005, p. 12). Different professions need different tools to execute their research effectively. Research tools are defined as 'a specific mechanism or strategy the researcher uses to collect, manipulate, or interpret data' (Leedy & Ormrod 2005, p. 12).

Six general tools are identified by Leedy and Ormrod (2005, p. 13):

- The library and its resources;
- The computer and its software;
- Techniques of measurement;
- Statistics;
- The human mind; and
- Language.

The **library** is a valuable tool for research. In the past it was regarded as a repository where books and other material were kept, but the role has changed and the needs of the patrons as well. Besides books and journals, information is made available through CD-ROM's, indexes and abstracts, catalogues as well as online databases. It is still important for a researcher to visit the library for browsing through the shelves to find books on a subject similar to the title he/she originally identified (Leedy & Ormrod 2005, pp. 13-15).

The **computer** plays an integral part in the researcher's life. Sources that fall under the computer category are the WWW, electronic mail and news, such as list serves (Leedy & Ormrod 2005, pp. 17-19).

Measurement is the third tool for research work. It is a way to ensure that the researcher stays objective while studying a phenomenon. Leedy and Ormrod (2005, p. 21) defined measurement as: 'Measurement is limiting the data of any phenomenon – substantial or insubstantial – so that those data may be interpreted and, ultimately, compared to an acceptable qualitative or quantitative standard'. Four categories or scales are identified as measurement, namely nominal, ordinal, interval and ratio (Leedy & Ormrod 2005, p. 25). The validity and reliability of measurement instruments influence the degree to what you can learn from the phenomenon studied, statistical significance in the data analysis, and the level of meaningful conclusions (Leedy & Ormrod 2005, p. 25).

According to Leedy and Ormrod (2005, p. 30) **statistics** have two main functions, which are to assist the researcher in describing the data and to draw inferences from the data. Descriptive statistics summarise the nature of the data that is obtained, and inferential statistics help the researcher to make decisions in connection of the data.

Leedy and Ormrod (2005, p. 31) regarded the human mind as the most important of all the research tools. The human mind can interpret the data to come to a logical conclusion as opposed to statistics where a large amount of information is organised and made more readily understood. The last research tool that is mentioned is **language** (Leedy & Ormrod 2005, p. 34). Language helps the researcher to communicate effectively with other people and also to think more clearly.

5.3 CONCEPT OF RESEARCH METHODOLOGY

According to Pickard (2007, p. xv) all research models begin at the philosophical level which defines the paradigm. Pickard (2007, p. xvi) described a paradigm as:

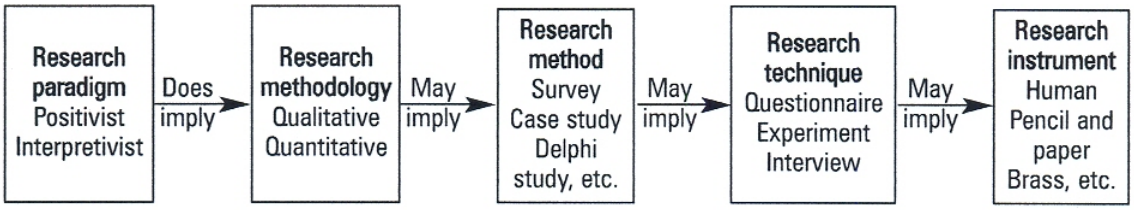
> '… the world view that is accepted by members of a particular scientific discipline which guides the subject of the research, the activity of the research and the nature of the research outputs'.

Leedy and Ormrod (2005, p. 12) explained research methodology as 'the general approach the researcher takes in carrying out the research project'. Leedy and Ormrod (2005, p. 94) categorised research methodology into two broad categories, namely quantitative research methodology and qualitative research methodology. This view is supported by Pickard (2007, p. xvi) as she explained that quantitative research is embedded in positivist thinking and qualitative research in interpretivist thinking. She outlined the research hierarchy with the research paradigm as the starting point (Pickard 2007, p. xvi). That is followed by the theoretical perspective, which is the research methodology. According to her there are two fundamental methodologies, quantitative and qualitative methodologies. Thereafter the researcher decides on the research method, which can also be called the strategy. Examples of research methods are case studies, surveys, experimental research, ethnography, Delphi study, grounded theory,

etc. The methods are followed by the research techniques, which she explained as the approach taken to data collection, for instance questionnaires, interviews, observation, focus groups, etc. The research instrument is the device that is designed or trained to collect the data (Pickard 2007, p. xvii). She used the term 'brass' instrument referring to earlier days when many of the laboratory instruments were made of brass. The term 'pencil and paper' describes a questionnaire that is being written by hand. The 'human' instrument in interpretivist research is the researcher who is trained to collect data in a natural setting. The device can also be computer software as is the case with transaction log analysis (Fourie & Bothma 2007, p. 264).

Following the preceding discussion, Figure 1 puts the research hierarchy in context according to Pickard's interpretation.

Figure 5.1: The research hierarchy (Pickard (2007, p. xv)



According to Bogdan and Biklen (2007, p. 35) the words, methodology and methods, are sometimes used synonymously or very often people use the words interchangeably. Bogdan and Biklen (2007, p. 35) described methodology as a 'more generic term that refers to the general logic and theoretical perspective for a research project' and methods as a term which describes the specific techniques that researchers use to collect their data, for instance, surveys, interviews and observation (Bogdan & Biklen 2007, p. 35). This view differs from that of Pickard as explained in the previous paragraph. According to her, 'research methods' refer to the strategy (surveys/phenomenological studies) of the research and 'techniques' to the approach (questionnaires/interviews) taken for data collection (Pickard 2007, pp. xvi-xvii). For the purpose of this study, the view of Pickard was followed. Leedy and Ormrod (2005, p. 135) referred to 'research designs' when they mentioned the methods, for example, case studies, ethnography, phenomenological studies, grounded theory studies and content analysis. To avoid confusion, the researcher will use the term 'research methods' in this study as referring to the 'strategy' taken, that is for example case studies, surveys, phenomenological studies, experimental research, ethnography, Delphi study, grounded theory. The researcher chose a survey as the 'research method' and questionnaires and interviews as the 'research techniques' for this study.

Babbie and Mouton (2001, p. 49) argued that social scientists use a variety of methods and techniques in empirical research, which depends on the tasks they perform. The methods and techniques vary from sampling, data collection and data-analysis, but they are always dependant on the aims and objectives of the study, the nature of the

phenomenon as well as the underlying theory or expectations of the researcher (Babbie & Mouton 2001, p. 49). Methods and techniques also include certain assumptions and values under specific conditions. Babbie and Mouton (2001, p. 49) used the term methodological paradigm to include the methods and techniques as well as the fundamental principles and assumptions regarding their use. They identified three methodological paradigms in social research, namely the quantitative, qualitative and the participatory action research (PAR) paradigms (Babbie & Mouton 2001, p. 49). Participatory action research started in the 1970's and was officially launched by the Cartagena World Symposium in 1977 (Babbie & Mouton 2001, p. 59). Two different traditions of participatory action research exist, that is the Southern and the Northern tradition (Babbie & Mouton 2001, p. 60). Whyte, Greenwood and Lazes (1991, p. 20) explained that in participatory action research:

> '… some of the people in the organization or community under study participate actively with the professional researcher throughout the research process from the initial design to the final presentation of the results and discussion of their action implications'.

Participatory action research contrasts sharply with the conventional model of pure research, in which members of the organisation are treated as passive subjects (Whyte, Greenwood & Lazes 1991, p. 20).

Participatory action research is discussed here only briefly as this study is focused on quantitative and qualitative methodologies, which are discussed more extensively in the next section. It will not pursue participatory action research at this stage.

5.4 QUANTITATIVE AND QUALITATIVE RESEARCH METHODOLOGIES

As mentioned in the previous section, this study focused on quantitative and qualitative methodologies. The quantitative methodology will be discussed first with special attention to the characteristics, questionnaires, sampling and data analysis which are appropriate for this study. Qualitative methodology will be discussed under the same headings, except for the method, which is an interview.

Where both quantitative and qualitative methodologies are present, it is called the 'mixed-methods' or the 'multiple strategies' approach (Chowdhury et al. 2008, p. 293; Gorman & Clayton 2005, p. 12). It is also referred to as 'triangulation', but this term, according to Gorman and Clayton (2005, p. 12), is not widely accepted, due to the opinion, for example Burgess (1991 cited in Gorman & Clayton 2005, p. 12) that it refers to three points of view within the triangle. According to Gorman and Clayton (2005, pp. 12-13) mixed-methods have two purposes, namely that (1) different aspects of the same research question is addressed, which extends the breadth of the project and improves the quality of the research, and (2) by using methods from different paradigms – positivist and interpretivist – the researcher can compensate for weaknesses in both paradigms. Chowdhury et al. (2008, p. 293) also noted the term multiple strategies and

stressed the fact that one method can complement another method to produce better results. Ma (2012, p. 1859, 1866) also recommended mixed methods research in library and information science:

> 'Mixed methods research that combines large-scale data analyses and a detailed description of community practice may provide us with a richer understanding of information and information-related phenomena' (Ma 2012, p. 1866).

Examples, where both quantitative and qualitative methodologies are present, feature in the studies reported by Lwoga, Stilwell and Ngulube (2011) as well as Nicholas et al. (2010).

5.4.1 Quantitative research methodology

Quantitative research is research that takes on a problem-solving approach and is highly structured in nature. Concepts are quantified for the purpose of measurement and evaluation (Powell & Connaway 2004, p. 3). Struwig and Stead (2001, p. 4) defined quantitative research as '… a form of conclusive research involving large representative samples and fairly structured data collection procedures'. The quantitative researcher considers that the best way to measure the properties of a phenomenon is through quantitative measurement, which is to assign numbers to the alleged qualities of things (Babbie & Mouton 2001, p. 49). According to Leedy and Ormrod (2005, p. 179), quantitative research explores the characteristics of a phenomenon or shows possible correlations between two or more phenomena. Examples of methods used in quantitative research are observation studies, experimental research and survey research.

Observation studies refer to watching a specific phenomenon very intensely (Powell & Connaway 2004, p. 157). The participants' current status is determined by observation and not by asking questions. In observation studies the focus is normally on a particular aspect of behaviour and the behaviour is quantified (Leedy & Ormrod 2005, p. 180). The researcher strived to be as objective as possible and used different strategies to achieve that. Observation studies require a great deal of planning, time and careful attention to detail (Leedy & Ormrod 2005, p. 180). Examples of observation studies found in the literature are the studies reported by Bustion and Harer (1992) as well as Cooper, Lewis and Urquhart (2004).

Experimental research can be described as where the researcher manipulates the independent variable and examines its effect on another dependent variable (Leedy & Ormrod 2005, p. 222; Powell & Connaway 2004, p. 60). Cause-and-effect relationships are described through experimental research (Leedy & Ormrod 2005, p. 217) and according to Powell and Connaway (2004, p. 60) it is the best method for testing casual relationships. Pickard (2007, p. 104) stated that experimental research is dealing with a number of different variables, namely the independent variable, the dependent variable,

the moderator variable and the control variable. Struwig and Stead (2001, p. 9) recorded two experimental designs, that is 'true experimental research design' and 'quasi-experimental research design', whereas Leedy and Ormrod (2005, p. 222) added 'pre-experimental design'.

Powell and Connaway (2004, p. 165) noted that experimental research methods are not used extensively in library and information studies and according to the literature, it is only used in 8-10% of the studies. Pickard (2007, p. 102) was not in favour of experimental research methods where human subjects are involved, as there are too many unstable elements to construct a true experiment. Golbeck, Koepfler and Emmerling (2011) and Vibert et al. (2009) used experimental research as method in their studies.

Powell and Connaway (2004, p. 83) described **survey research** as 'a group of research methods used to determine the present status of a given phenomenon'. Pickard (2007, p. 95) explained the purpose of surveys as 'to gather and analyse information by questioning individuals who are either representative of the research population or are the entire research population'. With survey research, the researcher was able to make conclusions of a large group of elements by studying a small number which was selected from the larger group. Leedy and Ormrod (2005, p. 183) called this approach a 'descriptive survey' or 'normative survey'. Surveys are also used for explanatory and exploratory purposes (Babbie & Mouton 2001, p. 232). Examples of descriptive survey research is that of Ackerman (2007) as well as Olorunsola and Ibegbulam (2003).

Survey research is regarded as a fairly straightforward design where willing participants are asked a set of standardised questions and their responses are summarised using percentages, frequency counts or statistical indexes (Leedy & Ormrod 2005, pp. 183-184). Interviews and questionnaires are typical research techniques used in survey research (Leedy & Ormrod, 2005, p. 184). According to Pickard (2007, p. 95) the terms 'survey' and 'questionnaire' are often used interchangeably, but she stressed that they are not the same thing. 'Survey' is a research method and 'questionnaires' are a data collection technique. Survey research is probably the most used research method in the social sciences (Babbie & Mouton 2001, p. 230) and is also very convenient when the participants are geographically dispersed (Powell & Connaway 2004, p. 84). Examples of questionnaire-based survey designs are that of Olorunsola and Ibegbulam (2003); Majid, Anwar and Eisenschitz (2001); Safahieh and Asemi (2010) and Sheeja (2010).

These three research methods all produce quantitative information, which can be analysed statistically (Leedy & Ormrod 2005, p. 179).

For the purpose of this study, survey research was chosen because information was needed from a relatively large number of people. The researchers and the other patrons of ARC-SGI's library are located in Bethlehem, Stellenbosch, Vaalharts and Riet River,

which makes questionnaires an appropriate choice for conducting the survey research. Questionnaires will be discussed in more detail after the characteristics of quantitative research.

5.4.1.1 Characteristics of quantitative research

The following characteristics of quantitative research are outlined by Machet and Maepa (2004, pp. 24-25) as well as Struwig and Stead (2001, pp. 5-6):

- Quantitative research mainly uses controlled experiments;
- Quantitative analysis is used to analyse a large amount of data statistically in order to give meaning to it;
- The study can be replicated;
- Quantitative research prefers data collection methods such as structured questionnaires and data analysis techniques;
- Quantitative research wishes to generalise results beyond the limits of the research sample;
- The individual is the focus of the empirical inquiry;
- Quantitative research is highly formalised and controlled by nature; and
- The methods used in quantitative research are similar to those used in the natural sciences.

5.4.1.2 Quantitative research techniques: questionnaires

A questionnaire is a data collection technique where a selected group of participants are asked to answer a series of questions, which can include both open and closed questions (Chowdhury et al. 2008, p. 290). The use of questionnaires is regarded as the most popular collection technique where human subjects are involved (Pickard 2007, p. 183). Questionnaires are distributed either through paper-based or electronic means (Chowdhury et al. 2008, p. 290). Electronic questionnaires are questionnaires that are either filled in online or questionnaires within an e-mail message (Pickard 2007, p. 198). Questionnaires that are developed in a word-processing package and sent through e-mail as an attachment are regarded as paper-based questionnaires.

The format of the questionnaire is as important as the questions that are asked (Babbie & Mouton 2001, p. 239). The researcher should remember participants are voluntarily involved and if the questionnaire is not properly laid-out or the questions are confusing, the participants may decide not to complete it. The following guidelines should be kept in mind to be effective (Babbie & Mouton 2001, p. 239; Pickard 2007, p. 185; Struwig & Stead 2001, pp. 89-90):

- The overall picture should be clear;
- Instructions should be precise and well-defined;

- Questions should be spread out and uncluttered;
- It should be divided into logical sections by subject;
- A questionnaire should start with questions that are easy to answer, and move from general to specific questions;
- Boxes where information must be filled in should be adequately spaced;
- Leading questions as well as potentially offensive questions must be avoided;
- Questions should be clear, without technical jargon; and
- The number of questions must be minimised to avoid respondent fatigue.

The literature consulted revealed a number of advantages and disadvantages of questionnaires. Based on the work of Matthews (2007, p. 63); Pickard (2007, p. 198) and Powell and Connaway (2004, pp. 125-126), the advantages and disadvantages of questionnaires are summarised in Table 5.1.

Table 5.1: Summary of the advantages and disadvantages of questionnaires

ADVANTAGES	DISADVANTAGES
Frank answers are encouraged due to the anonymity of the respondent	Paper-based questionnaires eliminate personal contact between the respondent and the researcher, which may lead to the loss of useful information
Eliminate possible interviewer bias	Answers cannot be qualified easily
Fixed format of questions tends to eliminate variation in the questioning process	There is a general resistance to mail questionnaires
Quantitative data are easy to collect and analyse	May be difficult for uneducated participants to complete. Questions can be misinterpreted
Large amounts of data can be collected in a short period of time	Non-responsive rates for surveys can be high
Can be relatively inexpensive to administer	Postal questionnaires are the most costly as stamps and envelopes must be supplied

Can be completed at leisure of the participants – within limits	Questionnaires distributed electronically will only reach those who have access and are comfortable with e-mail
Reduced risk of the researcher's appearance influencing responses	Electronic questionnaires remove anonymity if asked to return by e-mail

Questionnaires (mailed via electronic mail and received back as paper copies) were chosen as part of the data collection techniques at ARC-SGI because of the advantages thereof as depicted in Table 5.1 - especially since it renders anonymity to the patron and it is reasonably inexpensive. This method was also convenient for this study as not all the researchers and other patrons are stationed in Bethlehem, where the library is situated. A number of patrons are stationed in Stellenbosch, Vaalharts and Riet River. Researchers stationed in Bethlehem are also often not available in their offices due to work-related duties and field work.

As ARC-SGI is regarded a small institute, it was easy to overcome some of the disadvantages of questionnaires as stated in Table 5.1. Since the questionnaires were mailed via electronic mail, there were no costs involved such as envelopes and stamps. Contact between the researcher and the respondents were quite easy as the researcher knows the research and the support group working at the Institute. They felt comfortable to ask if a question was not clear and the researcher had the confidence to remind the respondents to complete the questionnaire.

5.4.1.2.1 Questionnaire

The questionnaire that was structured for this study had the following type of questions:

- Multiple choice questions;
- Likert scale questions; and
- Open-ended questions.

Some of the multiple choice questions offered an 'Other – please specify' option as well enabling the participant to elaborate on the choices offered. Four-point Likert scale questions were asked, which ranged from 4 (solely) and 1 (not at all). One ten-point scale question was incorporated to test the participants' satisfaction with the library services which are currently rendered. A few open-ended questions were included to give the participants the opportunity to voice their own opinions.

The questionnaire was divided into five sections, namely:

A. General;
B. Information needs;
C. Information sources;
D. Library services; and
E. Additional information.

Section A 'General' was needed to form a background picture of the participants and to categorise them into the correct group. The following question was asked:

1. What is your position in the ARC-Small Grain Institute?

Section B proposed to gain more knowledge on the information needs of the patrons. The questions were as follows:

1. For what purpose do you need information?
2. What type of information do you require?
3. On which broad categories of topics do you require information?
4. Which factors impact on your need for information?

Section C was aimed at information sources and the preferences of the patrons. The questions were structured as follows:

1. How often do you use the library to access needed information?
2. Do you normally use the library helping yourself or do you ask the personnel for assistance?
3. In what format do you prefer to view information?
4. Which databases do you normally use?
5. Which search engines do you use?
6. Which sources do you use to determine the availability of information on the research problem?
7. Which sources do you use to determine the methodology or techniques to solve the research problem?
8. Which sources do you use to keep up-to-date with new information in your area of interest?
9. Which problems do you experience when searching for information?
10. Which information sources do you use for study purposes?

Section D was aimed at the services that are currently rendered at the library and the needs of the patrons. The following questions were asked:

1. How important is the following services currently offered by the library to you?

2. What other type of services/sources do you require from the library?
3. Which services in addition to the above would you like the library to offer?

In Section D.4, on a scale of 10, the patrons had a chance to express their satisfaction/dissatisfaction with the services offered.

Section E, was included for any additional comments or recommendations:

1. Any other comments or recommendations you would like to add?

The researcher sent out the questionnaires as an attachment through electronic mail and requested the participants to print it, and after completion, either fax, mail or deliver it personally to the researcher's mail box. This ensured the anonymity of the participants and gave them the freedom to complete when convenient. As the researcher knows all the respondents at ARC-SGI, she has the ability to telephonically follow up on outstanding questionnaires. A copy of the questionnaire is attached as Appendix A.

5.4.1.3 Quantitative sampling

Sampling is a very important part of survey research (Powell & Connaway 2004, p. 92) and is used when it is not possible to include the total population in the survey (Pickard 2007, p. 59). 'Sampling is the process of selecting a few from the many in order to carry out empirical research' (Pickard 2007, p. 59). Sampling is divided into two basic groups, namely nonprobability sampling and probability sampling (Leedy & Ormrod 2005, p. 199; Powell & Connaway 2004, p. 94). Nonprobability sampling makes it impossible for the researcher to ensure that a specific element of a population will be included in the sample, which results in statistically inappropriate data (Powell & Connaway 2004, p. 94; Struwig & Stead 2001, p. 111).

Probability sampling guarantees that each segment is included in the sample, which ensures accurate representation of the population (Leedy & Ormrod 2005, p. 199; Powell & Connaway 2004, p. 96). Struwig and Stead (2001, p. 117) recommended this sampling technique.

When determining the sample size for quantitative studies, the literature emphasises 'the larger the better' (Leedy & Ormrod 2005, p. 207; Powell & Connaway 2004, p. 105). Gay and Airasian (2003 cited in Leedy & Ormrod 2005, p. 207) suggested that for small populations of fewer than 100, everyone should be surveyed. Powell and Connaway (2004, p. 107) recommend a sample size of 48 for a population size of 55. As the appropriate population at ARC-SGI is less than 100, all the research personnel as well as the support personnel working in the Facility, Human Resources and Finance divisions were included in the survey. The research personnel include the researchers, the research technicians and also the research assistants. The groups were referred to

as the Research group and the Support group. A total of 66 questionnaires were sent out, of which 25 to researchers, 17 to research technicians, 11 to research assistants and 13 to the administrative component of the support personnel.

5.4.1.4 Quantitative data analyses

Researchers strive for objectivity in their observations during research (Leedy & Ormrod 2005, p. 21). This can be achieved by a systematic way to measure the phenomenon under study. Leedy and Ormrod (2005, p. 21) defined measurement as follows: 'Measurement is limiting the data of any phenomenon – substantial or insubstantial – so that those data may be interpreted and, ultimately, compared to an acceptable qualitative or quantitative standard'.

The data was organised and analysed using Excel 2010. The data was then organised separately according to the two groups interviewed and arranged according to the semi-structured questions. The sorted data was discussed in detail by again separating the two groups and systematically captured the answers to the questions one by one. The researcher hoped to find a clear picture of the information needs and behaviour of all the patrons of ARC-SGI. The results of the questionnaires are discussed in Chapter 6 (section 6.2).

5.4.2 Qualitative research methodology

Qualitative research includes several research methods and does not describe a single method (Struwig & Stead 2001, p. 11; Leedy & Ormrod 2005, p. 133). According to Leedy and Ormrod (2005, p. 133), qualitative research concentrates on phenomena in their natural settings and studies them in all their complexity. Gorman and Clayton (2005, p. 3) defined qualitative research as:

> '…a process of enquiry that draws data from the context in which events occur, in an attempt to describe these occurrences, as a means of determining the process in which events are embedded and the perspectives of those participating in die events, using induction to derive possible explanations based on observed phenomena'.

Five research methods were identified by Leedy and Ormrod (2005, pp. 135-143), namely case studies, phenomenological studies, grounded theory studies, content analysis and ethnography.

Leedy and Ormrod (2005, p. 135) described **case studies** as an in-depth investigation into an individual, program or event for a defined period of time. Usually, a small number of subjects are intensely investigated opposed to the gathering of data from a large sample or population (Powell & Connaway 2004, p. 61). Various data collection techniques may be applied, for instance, questionnaires, interviews, observation and the analysis of documents (Powell & Connaway 2004, p. 61). According to Leedy and

Ormrod (2005, p. 135) case studies are usually applied in medicine, education, political science, law, psychology, sociology and anthropology. Examples of case studies are reported by Bracke (2011); Mitchell et al. (2011) and Safahieh & Asemi (2010).

Pickard (2007, p. 156) described **grounded theory** as a set of components and principles that should be included in the research method. She regarded it not as a particular research method, but it could be part of the design of an ethnographic study, a case study or action research. According to Leedy and Ormrod (2005, p. 140) a grounded theory study uses a prescribed set of procedures for analysing data and constructing a theoretical model from them. It is focused on a process with the purpose to develop a theory about that process. Data collection techniques include interviews, observations, documents, historical records, videotapes, etc. Grounded theory started in sociology, but has expanded to anthropology, education, nursing, psychology and social work (Leedy & Ormrod 2005, p. 140). A well-known example of grounded theory is the study executed by Ellis (1993, p. 469). Ellis (1993); González-Teruel and Abad-García (2012) as well as Park and Qin (2007) discussed studies where grounded theory were employed.

Content analysis is defined by Leedy and Ormrod (2005, p. 142) as '… a detailed and systematic examination of the contents of a particular body of material for the purpose of identifying patterns, themes, or biases'. It can be applied to almost any form of communication and include items such as books, magazines, poems, newspapers, songs, paintings, speeches, etc. (Babbie & Mouton 2001, p. 383). The fundamental idea is to classify the many words of the text into fewer content categories (Struwig & Stead 2001, p. 14). Content analysis may be incorporated into a cross-sectional study and ex post facto study as well as in a quasi-experimental study (Leedy & Ormrod 2005, p. 142). It is applied in various disciplines, namely psychology, history, art, education, journalism and political science (Leedy & Ormrod 2005, p. 142). An example found in the literature is a study done by Gosh (2009, p. 24) where content analysis was one of the research methods used. Content analysis was used in the studies reported by Cibangu (2013); Ghosh (2009) and Stockdale and Standing (2002).

Babbie and Mouton (2001, p. 279) described **ethnography** as the data of cultural anthropology that is derived from the direct observation of behaviour in a particular society. Ethnography focuses on an entire group that shares a common culture (Leedy & Ormrod 2005, p. 137). The researcher studies the specific group for a long period of time and concentrates on their everyday behaviours, which include interactions, language and rituals (Leedy & Ormrod 2005, p. 137). The purpose is to identify cultural norms, beliefs, social structures and other cultural patterns. Interviewing techniques and participant observation are used as data collection methods (Babbie & Mouton 2001, p. 280). According to Leedy and Ormrod (2005, p. 138), data collection and data analysis techniques include description, analysis and interpretation. Brennan-Horley et al. (2010);

Bryant (2009) as well as Bryant, Matthews and Walton (2009) used the ethnography method in their research.

Phenomenological studies are concerned about the detailed understanding of the phenomena under investigation as the individual experience the situation (Pickard 2007, p. 240). Leedy and Ormrod (2005, p. 139) defined it as: '… a study that attempts to understand people's perceptions, perspectives, and understandings of a particular situation'.

Interviews are the technique most used in phenomenological studies, which normally last between one to two hours in length (Leedy & Ormrod 2005, p. 139). Usually a sample size varies between 5 to 25 individuals who have very good experience with the phenomenon studied (Leedy & Ormrod 2005, p. 139). Data analysis involves firstly, the transcribing of the interviews and then the identification of statements that relate to the topic and the grouping of statements into units. The last step is to construct a composite (Leedy & Ormrod 2005, p. 140). Examples of studies using the phenomenological approach found in the literature are that of Brown and Duke (2006); Del Rio et al. (2002) and Klentzin (2010).

In this study, the researcher needed to understand the patrons' perceptions of the library as well as their information needs and behaviour. Phenomenological studies was chosen as the preferred research method for the study as the researcher needed an in-depth knowledge of the patrons of ARC-SGI to fulfil the purpose of the study, which is to render an effective service to ARC-SGI. By conducting individual interviews, the patrons get the chance to elaborate on what they need and on what they expect of the library in support of their research and other work.

5.4.2.1 Characteristics of qualitative research

The characteristics of qualitative research applicable to this study can be summarised as follows (Bogdan & Biklen 2007, pp. 4-6; Gorman & Clayton 2005, p. 7; Machet & Maepa 2004, pp. 25-26):

- Qualitative research studies the phenomena in their natural settings and the researchers are key data collection instruments themselves;
- Qualitative research concentrates on the unique characteristics and circumstances of the population under investigation;
- Qualitative research is descriptive of nature and is reported in a narrative form, rather than statistical tables;
- Qualitative research uses intensive and time-consuming methods, such as in-depth interviews and ethnographic studies;
- Qualitative researchers study human behaviour while it is happening;
- Qualitative researchers work with complex concepts;

- Qualitative research is concerned with the process of an activity and not only the result of the activity;
- Qualitative research is regarded as an approach, rather than a set of techniques; and
- Qualitative research recognises the importance of two perspectives of human behaviour, namely, the internal as well as the external perspective.

5.4.2.2 Qualitative research techniques: Interviews

Research techniques that are commonly used in phenomenological studies are interviews, observation, focus groups and content analysis (Struwig & Stead 2001, p. 11). For this study, interviews were chosen for the specific reason that in-depth information was needed on the researchers' information needs and their perception of the library services and resources.

Babbie and Mouton (2001, p. 289) defined interviewing as follows:

> 'A qualitative interview is an interaction between an interviewer and a respondent in which the interviewer has a general plan of inquiry but not a specific set of questions that must be asked in particular words and in a particular order'.

It is basically a conversation where the interviewer establishes the direction and the respondent do most of the talking.

Struwig and Stead (2001, pp. 98-99) identified three types of interviews, namely the standardised, semi-standardised and the unstandardised interview. Leedy and Ormrod (2005, p. 146) referred to open-ended, semistructered and unstructured interviews. Standardised or structured interviews consist of a number of questions from which the researcher does not deviate. Unstructured or open-ended interviews are the most flexible and allow free conversation between the interviewer and the participant (Leedy & Ormrod 2005, p. 146; Struwig & Stead 2001). Semi-standardised or semistructured interviews are a combination of structured and open-ended interviews (Struwig & Stead 2001, pp. 98).

The latter was chosen for this study because the researcher needed specific information from the participants as well as their own opinion on certain aspects. The interview schedule was therefore supplemented by formally structured questions and open-ended questions.

Seven stages of interviewing is described by Kvale and Brinkmann (2009, p. 102), which are thematising, designing, interviewing, transcribing, analysing, verifying and reporting. Thematising means that the purpose and the topic should be very clear before you decide on how you are going to proceed with the interview (Pickard 2007, p. 173). In the designing stage the process to follow is laid out in order to accomplish the purpose of the

study. It is in this phase that the researcher decides on what type of interview to follow. During the interviewing phase, the actual interviewing is conducted, which is followed by transcribing, i.e. writing down what has been said (Babbie & Mouton 2001, p. 290). Analysing consists of giving meaning to data collected in relation to the purpose of the study. The reliability and validity of the data are checked during the verifying phase and in the last phase, the reporting phase, the whole study is converged into a research report (Babbie & Mouton 2001, p. 290).

Gorman and Clayton (2005, p. 41) highlighted two important advantages of interviews in qualitative research. Firstly, the interviewee is encouraged by open-ended questions to communicate self-perceived issues which can be very valuable to the research. Secondly, the communication between the interviewer and the respondent may lead into unexpected directions, which add depth and breadth to the study. A number of advantages and disadvantages are listed in Table 5.2 below (Gorman & Clayton 2005, pp. 125-126; Powell & Connaway 2004, pp. 149-150).

Table 5.2: Summary of the advantages and disadvantages of interviews

ADVANTAGES	DISADVANTAGES
The interviewee may emphasise self-perceived issues	Bias threatens the validity of the interviews
Interviews can lead into unexpected, valuable directions	One-to-one interviews can be costly in terms of time
Interviews produce a better response rate	Interviews can be more expensive in terms of travel
Large quantities of rich data are collected in a relatively short period of time	Anonymity is lost in face-to-face interviews
Interviews are more efficient in revealing complex information than questionnaires	The sorting of important points in a large quantity of data can be difficult
Both parties can explore the meaning of questions and resolve any uncertainties	Interpersonal relationship more difficult to establish in online interviews than in person
Interviewing provides more personal contact to the data collection process	Internet interviews raise legal and ethical issues

The interviewer can rectify misunderstandings easily	
The interviewer can explore causation	
A longer interview than questionnaires still produces a better response rate	
The interviewer receives an immediate response to questions	

5.4.2.2.1 Interview schedule

The instrument which was used to conduct the interview schedule is a semi-structured questionnaire. It was divided into five sections:

A. General;
B. Library services and information sources;
C. Library collection;
D. Marketing of the library; and
E. Trends.

The questions in the General **Section A** were needed to form a background picture of the participants and to group them correctly. It consisted of the following questions:

1. What is your position in the ARC-Small Grain Institute?
2. How often do you use the library to access needed information?
3. Why do you use the library? / Why are you not using the library?

Section B was aimed at the awareness of library services and the patrons' preference for services and information sources. The questions were structured as follows:

1. Which of the services the library offers are most important to you?
2. Are there other services you would prefer the library to offer?
3. Are there other information sources you would prefer the library to offer?
4. Which sources other than the library do you use to obtain information and why?
5. How do you use the information obtained through the library services?
6. Which factors impact on your use of the library and information sources?
7. What is your opinion on the involvement of the librarian?
8. Can you please elaborate on your training needs in terms of the following services?

Section C highlighted the collection of the library as well as the physical facilities available. The following questions were included:

1. Does the library collection meet with your information needs? Please explain where the library can expand on its collection.
2. Do the topics covered by the library meet with your expectations and on which topics should the library expand?
3. Do the physical facilities in the library meet with your information needs?
4. What other physical facilities would you like to see in the library?

The marketing of a library is always a very important issue which needs to be addressed. **Section D** therefore focused on the marketing of the library:

1. What is your opinion about the library's efforts in promoting the library services (e.g. the use of e-mail notifications, scientific seminars, and displays in the library)?
2. Which other methods of promotion would you suggest?
3. Which methods of promotion would you prefer?

Section E was aimed at the trends in the agricultural environment both locally and internationally:

1. Which trends in the agricultural environment should the library note in order to improve its services and collection?
2. Which trends in the South African and international society should the library note in order to improve its services and collection?

A copy of the interview schedule is attached as Appendix B.

The interviews were audio-taped with the permission of the participants. Gorman and Clayton (2005, p. 137) recommended that the recorder should be 'small, quiet and generally inconspicuous'. Seidman (2006, pp. 114-115) advised to use a recorder with a good audio quality and to do a sound test before starting with the interview. The interviews were conducted in English and any Afrikaans responses were translated into English for the purposes of data analysis and discussion.

5.4.2.3 Qualitative sampling

Sampling is an important process as it is not always practical or possible to include everybody in the research population in the study (Pickard 2007, p. 59). She defined sampling as: '… the process of selecting a few from the many in order to carry out empirical research' (Pickard 2007, p. 59). Babbie and Mouton (2001, p. 166) identified two main types of sampling, namely, probability and non-probability sampling. They

examined four types of non-probability sampling, which are reliance on available subjects, purposive sampling, snowball sampling and quota sampling (Babbie & Mouton 2001, p. 166). According to Pickard (2007, p. 59), qualitative research tends to use purposive sampling. This view is confirmed by Gorman and Clayton (2005, p. 128): 'Most qualitative researchers prefer to select a purposive sample'.

Purposeful selection of samples is also the recommended method of Struwig and Stead (2001, p. 121) because with qualitative research, the researcher focuses on the richness of the data. Various sampling techniques for qualitative research are described by Struwig and Stead (2001, pp. 122-124):

- Extreme case sampling;
- Intensity sampling;
- Maximum variation sampling;
- Homogeneous sampling;
- Typical case sampling;
- Critical case sampling;
- Stratified purposeful sampling;
- Snowball or chain sampling;
- Criterion sampling;
- Theory-based sampling;
- Confirming and disconfirming cases;
- Opportunistic sampling;
- Purposeful random sampling; and
- Convenience sampling.

The researcher studied sampling techniques and decided that stratified purposive sampling is the best technique for this study. Stratification is described by Gorman and Clayton (2005, p. 128) as the approach to choosing representatives from particular groups. At ARC-SGI there are a group of staff members who uses the library regularly, a second group who does not use the library very often and a third group who never visits the library. In this study, where the researcher wanted to know more about the behaviour of the patrons of ARC-SGI and to review the sources and services rendered by the library, fifteen participants were selected for the interviews. These participants were selected from patrons who regularly use the library, patrons who do not use the library very often and lastly, patrons who seldomly use the library.

The sample size of fifteen compares well with the recommendation found in the literature. Powell and Connaway (2004, p. 189) described a case in a phenomenological study where a sample size of 10 is recommended in a population of 40. According to Leedy and Ormrod (2005, p. 139), a representative sample size for phenomenological studies is between 5 and 25 individuals.

5.4.2.4 Qualitative data analysis

Raw data needs to be organised and qualitatively analysed to give meaning to research. According to Powell and Connaway (2004, p. 196) data analysis is described as a set of procedures which is used to make valid interpretations from text. Interviews, observations and documents are categorised where words have the same meaning and connotation. Gorman and Clayton (2005, p. 206) defined data analysis as '… the process of bringing order, structure and meaning to the mass of collected data'.

Seidman (2006, p. 114) recommended that interviews be taped for the following reasons:

- Each word of the participant reflects his consciousness and should be recorded as accurately as possible;
- The original data are preserved through tape recording the interviews;
- The researchers can fall back on the taped data if any queries arise;
- The interviewers can study interviews and improve on their techniques; and
- The participants have the insurance that their words will be treated responsibly.

For the purpose of this study, the interviews were taped using a Philips Digital Voice Tracer recorder. This recorder has the ability to store the interviews in different folders and also to separate the questions using the Index button, which made the transcription process more organised. Each interview was transcribed using computer-based word-processing programmes, which were Microsoft Word 2010 and Microsoft Excel 2010. The transcribed versions of the interviews were approved by all the participants before the analysis began. The data of the semi-structured interviews were analysed and discussed question by question, therefore it was not necessary to apply any codes to organise the collected data. The interviews are discussed in Chapter 6 (section 6.3).

5.4.2.5 Reliability and validity

Reliability in qualitative research is regarded as being synonymous with consistency (Struwig & Stead 2001, p. 133). The interviewer is an integral part of the interview as he/she asks the questions and also sometimes shares his/her own experience. It is the interviewer's function to transcribe, interpret and analyse the data (Seidman 2006, p. 22). The interviewer should be very careful that personal views and comments do not influence the participants' responses (Gorman & Clayton 2005, p. 130). The interviewer's function is to listen and learn, not to preach, praise or condemn (Gorman & Clayton 2005, p. 130). The role of the interviewer should be supportive and understanding. Neutral probe-questions, such as 'Is there anything else?' and 'In what way?' can be asked to stimulate detailed information (Gorman & Clayton 2005, p. 131).

According to Struwig and Stead (2001, p. 135) the reliability of interviews can be ensured by applying the following techniques or methods:

- Use of pilot studies to determine if the participants understand the questions and find them useful;
- Training interviewers in interview techniques; and
- Letting two or more raters check the reliability of the codes allocated to the responses of the questions.

Mishler (1990, p. 419) defined **validation** as:

> '… the degree to which we can rely on the concepts, methods, and inferences of a study, or tradition of inquiry, as the basis for our own theorizing and empirical research'.

Struwig and Stead (2001, pp. 144-145) reported that there are several ways in which qualitative data can be validated. This includes descriptive validity, interpretative validity, triangulation and researcher's effects. **Descriptive validity** questions whether information received from participants are correct and comprehensive. Acquiring the assistance of other researchers or participants to examine the data, may improve the validity of the data. **Interpretative validity** indicates whether the participants' meanings and perspectives are accurately reported. **Triangulation** suggests which independent measures confirm or contradict the results (Struwig & Stead 2001, p. 145). The **researcher's effects** states how biased he or she is in reporting and interpreting the data. The researcher's background and presence may influence the collection of data and should be explained in the report (Struwig & Stead 2001, p. 145).

To ensure reliability and validity in this study, descriptive validity will be followed. The fully transcribed interviews were sent back to the participants via electronic mail for final approval. This was to check if the researcher understood and interpreted correctly what the participant meant. Sometimes the participant can supply more data on a given subject (Pickard 2007, p. 179).

5.5 RESEARCH ETHICS

Research ethics play an important part in research for the reason that humans are involved in the research (Chowdhury et al. 2008, p. 294). This statement is also stressed by Powell and Connaway (2004, p. 68).

The following ethical guidelines should be followed in research:

- Participants taking part in questionnaires and interviews should do so as volunteers;
- No harm should be done to the participants;
- The researcher should use the data anonymously;
- Participants' privacy must be honoured;
- The researcher must only use the data for the stated research and not for any other purposes;
- The researcher should avoid personal and sensitive questions;
- The researcher must tell the truth when writing and reporting on findings. Negative as well as positive results should be reported; and
- The researcher should not use the data for commercial or other purposes (Babbie & Mouton 2001, pp. 520-526; Bogdan & Biklen 2007, pp. 49-50; Chowdhury et al. 2008, p. 294).

Bogdan and Biklen (2007, p. 48) accentuated two issues that dominate guidelines where humans are involved: firstly, voluntary participation and secondly, that the participants should not be exposed to risks which are greater than what they gain in the process. The participants are usually protected by consent forms stating the nature of the research, what the researcher plans to do with the findings and other relevant information (Bogdan & Biklen 2007, p. 48). They also noted that Institutional Review Boards exist in colleges and universities where research proposals are reviewed and approved.

To comply with the ethics issue in research, the researcher compiled an 'Informed consent form' explaining the title and nature of the current research. The participants signed to voluntary participation and confidentiality was guaranteed. An example of the consent form is attached as Appendix C. The researcher applied to the Faculty of Engineering, the Built Environment and Information Technology Committee for Research Ethics and Integrity for approval of the research project – as well as to the ARC. Attached to the application was the declaration of the researcher where voluntary participation and confidentiality of the participants were assured. Copies of the researcher's declaration as well as the letters of approval from the University of Pretoria and the ARC are attached as Appendix D, E and F respectively.

5.6 CONCLUSION

This chapter discussed the research methods and techniques used to complete the empirical part of this study. Quantitative methods as well as qualitative methods were explained in detail. A survey study and a questionnaire were chosen as the research method and research technique for the quantitative component. The characteristics, advantages and disadvantages of questionnaires have been highlighted. Semi-structured interviews were chosen as research technique for the qualitative component.

Attention was given to the sampling process, analysis of data as well as the research ethics of research.

Chapter 6 will be devoted to the data analysis and the interpretation of the data.

CHAPTER 6

DATA ANALYSIS AND DISCUSSION OF RESULTS

6.1 INTRODUCTION

In Chapter 5 the research methods were discussed in detail. In Chapter 6 the data will be analysed and the results will be discussed. Data were collected using quantitative as well as qualitative research methodologies. Firstly, the results of the questionnaires will be discussed according to the questions asked. Secondly, the results of the interviews will be discussed.

6.2 DISCUSSION OF QUESTIONNAIRES

Questionnaires were sent to researchers, research technicians, research assistants and administrative support personnel via e-mail. Most of the respondents printed the questionnaires, completed them and handed them back either personally, or placed it in the library's mail box, or faxed it back to the library. Two respondents completed the questionnaires on their computers, and e-mailed it back to the library. The questionnaires will be discussed in detail question by question in the different sections. Where applicable, researchers and research technicians will be treated as one group (**Research group**) and the support group as a separate group (**Support group**). Twenty-five questionnaires were sent to researchers, 17 to research technicians, 11 to research assistants and 13 to the administrative support personnel. As explained in Chapter 1 (section 1.9) the number of personnel members differed at the time of the investigation to the current number of personnel members in May 2013. Not all of the research assistants were included, but only those who had access to e-mail.

The best response (20/25) (80%) came from the research personnel, which can be regarded as very positive as they are the group who normally uses the library the most. A just above average response was received from the research technicians (10/17) (59%), which can be regarded as satisfying. No response was received from the research assistants (0/11) (0%), which was a little bit disappointing. However, it is a group who do not use the library regularly. Good response was received from the support group (10/13) (77%), which are very satisfying as their responses are also regarded as very important to the library for services in the future. The responses are displayed in Table 6.1. The research sample is explained in more detail in Chapter 5 (section 5.4.1.3).

The questionnaire was divided into the following sections:

A: General;
B: Information needs;
C: Information sources;
D: Library services; and
E: Additional information.

A copy of the questionnaire is attached as Appendix A.

In some of the questions the respondents could choose more than one option. It is therefore important to remember that the results should be interpreted as the number of choices selected out of a possible total of 30 for the **Research group** and out of a total of 10 for the **Support group**. Extra space was provided for respondents to add additional purposes to the options listed. Where no options were chosen, it will be indicated as '0' (this is applicable to all the tables).

In the applicable questions, weights had been allocated (Solely=4; Most of the time=3; To some extent=2 and Not at all=1). These weights have been used to determine the ranking of the sources.

6.2.1 Question A.1: What is your position in the ARC-Small Grain Institute?

The first question was meant to indicate what positions the respondents have at ARC-SGI. Table 6.1 below also shows the number of questionnaires that have been sent out and received. A detailed discussion is given in section 6.2.

Table 6.1: Position occupied in the organisation

Position	Questionnaires sent out	Questionnaires received	Percentage
Researchers	25	20	80.00
Research technicians	17	10	58.82
Research assistants	11	0	0
Support personnel	13	10	76.92

6.2.2 Question B.1: For what purpose do you need information?

For this question on purposes for needing information, the respondents could choose more than one option.

As displayed in Table 6.2 'research' (28/30) (93%) was the most popular purpose for needing information amongst the **Research group**. This is fully supportive of the goal of the ARC, which is a research organisation. Second and third choices are 'project proposal' (14/30) (47%) and 'study' (12/30) (40%) purposes, followed by 'solving work-

related problems' (10/30) (33%). One (1/30) (3%) researcher added 'article writing' as a purpose for needing information.

The **Support group** needed information for 'solving work-related problems' (6/10) (60%) as well as 'administrative purposes' (6/10) (60%). This is followed by 'management purposes' (4/10) (40%). One of the support personnel added 'road ordinance' as an extra subject in which he needed information. The results of this question are summarised in Table 6.2.

Table 6.2: Purposes for needing information

Groups	Research	Study	Project proposal	Solving work-related problems	Management purposes	Administrative purposes
Research group (n=30)	28	12	14	10	4	1
Support group (n=10)	0	2	1	6	4	6

6.2.3 Question B.2: What type of information do you require?

The respondents were allowed to choose more than one option and had the opportunity to add other types of information in a separate column. The **Research group** chose 'background information' (27/30) (90%) as well as 'research findings' (27/30) (90%) as the type of information they need most. 'Research methods' (22/30) (73%) was chosen as the third type of information needed. As a research organisation, the Research group need background information in any project that they work on and especially when they start with a new project or research study. Research findings are equally important as it is important for them to know to what conclusions other researchers came to in their studies. These types of information also ensure that they do not duplicate work that has already been done by other researchers.

The three types of information required by the **Support group**, was firstly 'definitions and clarification of concepts' (7/10) (70%), then 'solutions to problems' (4/10) (40%) and thirdly 'background information' (3/10) (30%). Where nothing was marked, it is indicated by a '0' in Table 6.3. The type of information required for both groups is summarised in Table 6.3.

Table 6.3: Type of information required

Groups	Background information	Research findings	Reported research projects	Research methods	Research instruments	Solutions to problems	Correct citations	Definitions and clarification of concepts
Research group (n=30)	27	27	16	22	7	15	16	11
Support group (n=10)	3	0	0	0	0	4	0	7

The two groups also identified other types of information, which include:

Research group:

- General knowledge and agriculture-related topics, as well as scientific studies other than agriculture; and
- Study materials related to studies.

Support group:

- Road Ordinances and other motor fleet related information;
- Acts - OHS Act, Labour relations, Basic conditions of employment, etc.;
- New technology and software;
- Dictionary;
- Technical information regarding air conditioning and electrical apparatus; and
- Articles (as appropriate to the General Manager, he did not specify the type of articles).

These types of information needed differ according to the different groups working at ARC-SGI and are very specific to the kind of work that the person is doing.

6.2.4 Question B.3: On which broad topics do you require information?

In this question the respondents again had the option to choose more than one topic and to add additional topics in a separate column that is not covered by the topics stated in Table 6.4. Among the **Research group** 'crop protection' (20/30) (67%) was identified as the topic on which most researchers needed information, followed by 'entomology' (14/30) (47%) and thirdly by 'plant breeding' (13/30) (43%). The top three topics identified by the **Support group** are 'human resources' (4/10) (40%), 'strategic management' (3/10) (30%) and 'financial management' (2/10) (20%). The results are summarised in Table 6.4.

Table 6.4: Broad topics of information

Groups	Biological control	Biological farming	Bio-technology	Crop protection	Ecology	Entomology	Financial management	Human resources
Research group (n=30)	12	4	7	20	5	14	4	1
Support group (n=10)	0	0	0	1	0	0	2	4

Groups	Plant breeding	Plant pathology	Plant physiology	Soil cultivation	Soil fertility	Statistics	Strategic management	Weed science
Research group (n=30)	13	9	10	5	6	12	3	5
Support group (n=10)	1	0	1	1	0	0	3	0

Other topics identified by the two groups are:

Research group:

- Daily financial information;
- Laws: legislation regarding health and safety matters; employment equity; PMFA, etc.;
- Experts in specific fields of science;
- Crop Science; and
- Quality, such as wheat end-use quality and bread wheat quality.

Support group:

- Transport related information;
- Health and safety matters;
- Facilities management;
- IT related information;
- Technical information regarding electrical and air conditioning maintenance and new equipment; and
- Information and graphs from, for example: Grain SA website for use in presentations for the General Manager.

Again, this is very job related topics and will differ from person to person according to their needs. No detailed information is given by way of precaution in not violating the confidentiality of the respondents.

6.2.5: Question B.4: Which factors impact on your need for information?

There are certain factors that influence the library patrons' need for information and why they use the library. These factors range from issues and needs that arise from work or research projects that they are busy with, to study purposes, and constraints for not coming to the library as regularly as they would like to.

According to the **Research group**, the main factor that influenced their needs for information was their research projects as indicated by 19/30 (63%) respondents. The aspects of their research projects that instigate information needs can be categorised as follows:

- Research outcomes on other similar research;
- Writing of research proposals and reports;
- Problem solving;
- Searching for methodologies;
- Background information needed on proposed projects;
- Curiosity;
- Latest, accurate information available needed on a specific subject;
- The availability of journals;
- Doing presentations at universities and other events;
- To prepare for international visitors;
- Dealing with enquiries from farmers and other external clients; and the
- Writing of articles for scientific and popular publications.

Four (4/30) respondents of the **Research group** indicated that they use the library for study purposes, i.e. they come to find a quiet place to work undisturbed and not necessarily using library information. Three respondents (3/30) (10%) of the Research group indicated that they experience the lack of time as a constraint not to visit the library. One respondent (1/30) (3%) indicated involvement in 'strategic management' as a factor for information needs. One respondent (1/30) (3%) indicated that she needs information from the library because of the failure of tests and assignments and the fact that she feels she is not doing her job efficiently and effectively.

In the **Support group**, three respondents (3/10) (30%) indicated that their need for information is the factor why they use the library. Such information needs include the following:

- Information regarding insurance and transport;

- Information required from external clients; and
- Information required for the General Manager.

Two respondents (2/10) (20%) indicated that they use the scanning facilities in the library, i.e. they only use the equipment and not the information. One respondent also indicated time as a constraint for not using the library. One respondent (1/10) (10%) said that she needs information from the library to fulfil requests received from clients.

6.2.6 Question C.1: How often do you use the library to access needed information?

Eighteen (18/30) (60%) of the **Research group** indicated that they visit the library on a monthly basis, six (6/30) (20%) visit the library on a weekly basis and six (6/30) (20%) seldom visit the library. Most of the **Support group** indicated that they seldom (5/10) (50%) visit the library; three (3/10) (30%) visit the library on a monthly basis and two (2/10) (20%) on a weekly basis. The results indicate that the visits to the library of the **Research group** are overall satisfactory, but the fact that there are six researchers that seldom visit the library needs to be investigated. The latter is also applicable on the Support group. This shows that the library services to the **Support group** should be investigated in the future. The visits to the library are summarised in Table 6.5.

Table 6.5: Library access for information

Groups	Daily	Weekly	Monthly	Seldom	Never
Research group (n=30)	0	6	18	6	0
Support group (n=10)	0	2	3	5	0

6.2.7 Question C.2: Do you normally use the library helping yourself or do you ask the personnel for assistance?

Half of (15/30) (50%) of the **Research group** indicated that they are able to help themselves in the library, but also ask for assistance when necessary. Two (2/30) (7%) indicated that they help themselves and thirteen (13/30) (43%) normally ask for assistance. The results are almost the same for the **Support group**, with five (5/10) (50%) who help themselves and also ask for assistance; three (3/10) (30%) ask for assistance; one (1/10) (10%) help him/herself and one (1/10) (10%) indicated that he/she does not use the library. The results show that the majority of the patrons feel comfortable in using the library and that they have the confidence to ask for help when needed. The results are summarised in Table 6.6.

Table 6.6: Need of library assistance

Groups	Help myself	Ask for assistance	Both	Do not use the library
Research group (n=30)	2	13	15	0
Support group (n=10)	1	3	5	1

6.2.8 Question C.3: In what format do you prefer to view information?

More than one option could be chosen in this question and the results should be interpreted out of a possible 30 for the Research group and out of 10 for the Support group. Fourteen (14/30) (47%) of the **Research group** chose 'both abstracts and full text'; ten (10/30) (33%) indicated 'full text' and three (3/30) (10%) chose 'abstracts' as their preferred choice. 'Both print and electronic' was indicated fourteen times (14/30) (47%); 'print' eight times (8/30) (27%) and 'electronic' six times (6/30) (20%). The results showed that the **research group** used both abstracts as well as full text, which may be in accordance with the specific stage of their research. Abstracts are important at first to establish if an article is needed before requesting the full text version. The results are summarised in Table 6.7.

The **Support group** indicated that the full text was more important to them than the abstracts as 'full text' were marked three times (3/10) (30%) and 'abstracts' got no marks (0/10) (0%) at all. 'Print' as well as 'electronic' was both mark twice (2/10) (20%), with 'both print and electronic' chosen five times (5/10) (50%). This showed that they also prefer both print and electronic versions of the needed information.

Table 6.7: Preferred format for information

Groups	Abstracts	Full text	Both abstracts and full text	Print	Electronic	Both print and electronic
Research group (n=30)	3	10	14	8	6	14
Support group (n=10)	0	3	1	2	2	5

6.2.9 Question C.4: Which databases do you normally use?

Databases are used by the **Research group** to execute literature searches; to locate articles and journals; for background information and for the writing of project proposals. The weighted index was calculated on a 4-point scale to determine the ranking order of the preferred choices of the respondents. The weights were allocated as: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

In the current investigation the **Research group** indicated that their preferred database is 'SpringerLink', followed by 'ScienceDirect' in the second place and 'CAB' in the third place. The ARC subscribes to the full text version of SpringerLink, which may contribute to its preferred choice. The ARC does not subscribe to ScienceDirect, but researchers who are registered for further studies are able to access the full text version of ScienceDirect through their universities' websites, which also makes it a popular choice for a database. CAB is also a subscription database of the ARC, with access to the bibliographic information and abstracts as well as the occasional full text article.[1]

This question gave the respondents the opportunity to add other databases that were not on the initial list and they are listed as follows:

- ISI Web of Knowledge;
- Journal STORage (JSTOR);
- Southern African Bibliographic Information Network (SABINET);
- University of the Free State (used by registered students);
- Google Scholar; and
- Bookshops: Kalahari.Net[2]

One respondent indicated that Google Scholar was used to get access to the databases. Two respondents also indicated the 'librarian' as another database. The results for the **Research group** are captured in Table 6.8.

Table 6.8: Use of databases by the Research group (n=30)

Databases	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
SpringerLink	2	14	6	3	2.17	1
ScienceDirect	0	13	7	4	1.90	2
CAB	0	5	13	4	1.50	3
Agricola	0	3	6	8	0.97	4
EBSCO	0	1	6	10	0.83	5
Scopus	0	1	2	14	0.70	6
Scirus	0	0	1	14	0.53	7

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

The **Support group** indicated that they do not use databases at all. The reason could be that they do not need to do literature searches; that their needed information is available on ARC inhouse resources, such as the Intranet and Central Office; they use search engines as well as their own resources. These reasons are only speculation and no further information could be collected. One of the Support group indicated that he used the Internet as a database.

[1] After collecting empirical data, the ARC added CAB e-Books, BioOne, ISI Web of Science, Nature, OECD, Science and ScienceDirect to its subscribed E-content.
[2] Kalahari.Net is a South African based online bookstore, similar to Amazon.com

6.2.10 Question C.5: Which search engines do you use?

Search engines are one of the most popular choices of entry point when searching for information. Amongst the **Research group**, Google was ranked number one as the search engine most used with nine (9/30) (30%) indicating that they solely use it and seventeen (17/30) (57%) uses Google most of the time. Google Scholar was chosen in second place with one (1/30) (3%) indicating that it is used solely and twelve (12/30) (40%) most of the time. It is interesting that four (4/30) (13%) indicated that they do not use Google Scholar at all. Yahoo ended in third place, followed by Dogpile, MSN, Metacrawler and KartOO. The last two might not be well known by all the researchers, resulting in 8 indicating that it is not used at all. The results are summarised in Table 6.9.

Table 6.9: Use of search engines by the Research group (n=30)

Search engines	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Google	9	17	2	0	3.03	1
Google Scholar	1	12	1	4	1.53	2
Yahoo	0	3	5	4	0.77	3
Dogpile	0	2	3	6	0.60	4
MSN	0	1	2	6	0.43	5
Metacrawler	0	0	1	8	0.33	6
KartOO	0	0	0	8	0.27	7

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

This question also allowed the option to add other search engines that did not appear on the list. The University of the Free State was added to this list and again one of the respondents added the librarian as another search engine, of which neither qualifies as search engines.

Table 6.10 showed that the **Support group** also chose Google as their preferred search engine with four (4/10) (40%) who use it solely, four (4/10) (40%) most of the time and one (1/10) (10%) to some extent. Yahoo was ranked second and Google Scholar and MSN shared the third and fourth places. Dogpile, KartOO and Metacrawler were not used at all by the support group. Other search engines that were added by the **Support group** were Amazon and Wikipedia - these are good information resources, but do not qualify as search engines.

Table 6.10: Use of search engines by the Support group (n=10)

Search engines	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Google	4	4	1	1	3.10	1
Yahoo	0	1	1	1	0.60	2
Google Scholar	0	0	1	1	0.30	3
MSN	0	0	1	1	0.30	3
Dogpile	0	0	0	2	0.20	5
KartOO	0	0	0	2	0.20	5
Metacrawler	0	0	0	2	0.20	5

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

Google clearly stood out as the most popular search engine to both the **Research group** and the **Support group**.

6.2.11 Question C.6: Which sources do you use to determine the availability of information on the research problem?

Researchers need information to fulfil various purposes during their research or project work. This can be categorised as the need to determine the availability of information or background information on a certain topic; the need for specific information (technologies or methodologies) that arises during the course of the work; and thirdly, the need for information to keep up-to-date with developments on their specific projects. The following three questions (C.6; C.7 and C.8) are closely related with the purpose of determining which sources the researchers of ARC-SGI use to fulfil their information needs in the various stages of their research work. With all three questions, the respondents could choose more than one option. They also had the option to add any other sources if they wished so.

In the **Research group** the question on determining the availability of information, 'journals' and 'search engines' as sources of information resulted in the same weighted index (2.53), but as the 'journals' were indicated twice (2/30) in the solely category against the naught (0/30) in 'search engines'; 'journals' were ranked number one and 'search engines' as number two. 'Books' were chosen as the third source and 'personal information sources' in the fourth place. The complete results are shown in Table 6.11. One respondent added 'ask the librarian' as an additional source used.

Table 6.11: Sources used by the Research group to determine the availability of information (n=30)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Journals	2	18	7	0	2.53	1
Search engines	0	22	5	0	2.53	2
Books	0	16	9	0	2.20	3
Personal information sources (e.g. conversations with colleagues and other experts)	0	7	13	1	1.60	4
Research reports (internal as well as external)	0	6	15	0	1.60	5
Table of Contents (TOC) alerts	0	10	8	2	1.60	6
Workshop, seminar and conference proceedings	0	5	16	0	1.57	7
Dissertations / theses	1	5	13	0	1.50	8
Databases (e.g. saved search profiles)	1	5	10	0	1.30	9
Annual reports	0	4	9	5	1.17	10
Library catalogues	0	0	7	9	0.77	11
Electronic discussion lists	0	0	3	12	0.60	12

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

The **Support group** indicated that ‘search engines’ were the number one preferred source; ‘books’ were ranked number two and ‘personal information sources’ in the third place. ‘Workshop, seminar and conference proceedings’ and ‘annual reports’ resulted in the same weighted index, but as the ‘workshop, seminar and conference proceedings’ was indicated once (1/10) (10%) in the solely category, as compared to the naught (0/10) (0%) in ‘annual reports’, it was ranked as number 4. The same rules apply for ‘research reports’, ‘journals’ and ‘databases’ and were therefore ranked as numbers 6, 7 and 8. The last three sources were not used at all and therefore ranked collectively as number 10. The complete results are shown in Table 6.12. No additional sources were added by this group.

Table 6.12: Sources used by the Support group to determine the availability of information (n=10)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Search engines	1	3	1	0	1.50	1
Books	0	3	2	0	1.30	2
Personal information sources (e.g. conversations with colleagues and other experts)	0	4	0	0	1.20	3
Workshop, seminar and conference proceedings	1	0	2	0	0.80	4
Annual reports	0	2	1	0	0.80	5
Research reports (internal as well as external)	1	0	0	0	0.40	6
Journals	0	1	0	1	0.40	7
Databases (e.g. saved search profiles)	0	0	2	0	0.40	8
Library catalogues	0	0	1	0	0.20	9
Dissertations / theses	0	0	0	1	0.10	10
Electronic discussion lists	0	0	0	1	0.10	10
Table of Contents (TOC) alerts	0	0	0	1	0.10	10

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

6.2.12 Question C.7: Which sources do you use to determine the methodology or techniques to solve a research problem?

During research work or projects, the researcher may encounter problems regarding various issues, i.e. which methodologies or techniques are the best to use with different effects. This question was asked to ascertain which sources they used to find solutions to the problems encountered with regard to deciding on the methodology or techniques to solve a research problem.

The **Research group** chose ‘journals’ as their first option to find solutions, with ‘search engines’ in second place and ‘books’ in the third place. Table 6.13 shows the complete results. No additional sources were added.

Table 6.13: Sources used by the Research group to determine methodology and techniques (n=30)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Journals	1	22	5	0	2.67	1
Search engines	0	18	3	2	2.07	2
Books	0	14	7	2	1.93	3
Dissertations / Theses	2	10	7	1	1.77	4
Personal information sources (e.g. conversations with colleagues and other experts)	0	8	10	0	1.47	5
Research reports (internal as well as external)	0	6	6	3	1.10	6
Workshop, seminar and conference proceedings	0	2	13	1	1.10	7
Databases (e.g. saved search profiles)	1	2	8	4	1.00	8
Table of Contents (TOC) alerts	1	4	4	5	0.97	9
Electronic discussion lists	1	1	3	9	0.73	10
Annual reports	0	1	6	6	0.70	11
Library catalogues	0	1	2	9	0.53	12

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

The **Support group** indicated that they first use ‘personal information sources’; secondly, ‘search engines’; and thirdly, ‘books’ to resolve their problems. ‘Annual reports’ and ‘research reports’ were both marked once in the ‘most of the time’ column and therefore share the sixth place. The last four sources were not used at all. The complete results are summarised in Table 6.14. No additional sources were added by this group.

Table 6.14: Sources used by the Support group to determine methodology and techniques (n=10)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Personal information sources (e.g. conversations with colleagues and other experts)	1	3	0	0	1.30	1
Search engines	0	3	1	0	1.10	2
Books	1	1	1	0	0.90	3
Workshop, seminar and conference proceedings	1	1	0	0	0.70	4
Databases (e.g. saved search profiles)	0	0	2	0	0.40	5
Annual reports	0	1	0	0	0.30	6
Research reports (internal as well as external)	0	1	0	0	0.30	6
Library catalogues	0	0	1	0	0.20	8
Dissertations / Theses	0	0	0	1	0.10	9
Electronic discussion lists	0	0	0	1	0.10	9
Journals	0	0	0	1	0.10	9
Table of Contents (TOC) alerts	0	0	0	1	0.10	9

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

6.2.13 Question C.8: Which sources do you use to keep up-to-date with new information in your area of interest?

It is important for researchers to keep up-to-date with new information and developments in their subject field on a continuous basis to ensure that they do not stay behind while doing research that could be internationally recognised. For this purpose the **Research group** chose ‘journals’ as their most important source, followed by ‘search engines’ with ‘books’ in the third place. The complete results are shown in Table 6.15. No additional sources were added.

Table 6.15: Sources used by the Research group to keep-up-to-date with new information (n=30)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Journals	5	17	3	1	2.60	1
Search engines	1	20	5	0	2.47	2
Books	2	10	6	2	1.73	3
Workshop, seminar and conference proceedings	1	9	9	0	1.63	4
Personal information sources (e.g. conversations with colleagues and other experts)	1	5	12	1	1.47	5
Dissertations / Theses	1	9	5	1	1.40	6
Table of Contents (TOC) alerts	0	10	4	3	1.37	7
Research reports (internal as well as external)	0	8	7	2	1.33	8
Annual reports	0	5	7	4	1.10	9
Electronic discussion lists	1	3	5	6	0.97	10
Databases (e.g. saved search profiles)	1	2	6	6	0.93	11
Library catalogues	0	3	5	7	0.87	12

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

The **Support group** chose ‘search engines’ as their preferred choice of keeping up-to-date, with ‘books’ as their second choice and ‘personal information sources’ as their third choice. The complete results are shown in Table 6.16 below. The **Support group** added two other sources, namely ‘LinkedIn’ and ‘SkillsPages’, which they also use to keep up-to-date.

Table 6.16: Sources used by the Support group to keep-up-to-date with new information (n=10)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Search engines	2	3	1	0	1.90	1
Books	0	4	1	0	1.40	2
Personal information sources (e.g. conversations with colleagues and other experts)	0	3	1	0	1.10	3
Annual reports	0	2	0	0	0.60	4
Research reports (internal as well as external)	0	2	0	0	0.60	4
Workshop, seminar and conference proceedings	0	1	1	0	0.50	6
Electronic discussion lists	0	1	0	1	0.40	7
Databases (e.g. saved search profiles)	0	1	0	0	0.30	8
Dissertations / Theses	0	0	1	0	0.20	9
Journals	0	0	1	0	0.20	9
Library catalogues	0	0	1	0	0.20	9
Table of Contents (TOC) alerts	0	0	0	1	0.10	12

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

To conclude questions C.6 to C.8 it is interesting to note that in the **Research group** the first three preferred choices were the same in all three questions. ‘Journals’ was the number one choice; with ‘search engines’ the second choice and ‘books’ their third choice.

The **Support group** had the same three choices in the top three positions, although not in the same fixed order as the research group. These three choices are ‘search engines’, ‘personal information sources’ and ‘books’.

6.2.14 Question C.9: Which problems do you experience when searching for information?

Patrons sometimes encounter problems when searching for information. The respondents were provided with a list of possible problems as displayed in Table 6.17, but they had the option to add additional problems in a separate column. They could also choose more than one option.

One problem experienced in the **Research group** that clearly stood out, was ‘limited access to global information databases’, which was indicated fourteen (14/30) (47%) times. ‘Slow internet bandwidth’ and ‘articles in foreign languages’ were each marked

nine (9/30) (30%) times and 'not aware of relevant sources to search for information' was marked eight (8/30) (27%) times.

The **Research group** added the following comments in the additional column:

- Firewalls set up as part of company policy bias search results;
- Limited access to electronic full text resources makes it impossible to do independent literature searches and obtain the most recent and relevant information;
- In cases where full text is required you'll find that only the abstract is available and full text only available through purchase;
- Full access not always available;
- I do not have any problems finding information I need. If I can't find it myself or it is not locally available, the librarian assists me to find it;
- Finally I usually get what I am looking for;
- I have no problems accessing information (University of Stellenbosch is close by); and
- Limited access to full text journal articles.

Out of these additional comments the limited access to full text articles appears to be the biggest problem for the **Research group** as it was indicated by three (3/30) respondents.

There were no outstanding problems identified by the **Support group**. 'Slow Internet bandwidth' and 'not aware of relevant sources to search for information' were both marked three (3/10) (30%) times. 'Ineffective search techniques', 'limited access to global information sources' and 'results not applicable to your information needs' all were marked twice (2/10) (20%). The **Support group** did not add any additional comments. The results are shown in Table 6.17.

Table 6.17: Problems experienced during searching

Groups	No Internet connection	Slow Internet bandwidth	Articles in foreign languages	Ineffective search techniques	Not aware of relevant sources to search for information	Limited access to global information databases	Results not applicable to your information needs
Research group (n=30)	3	9	9	4	8	14	7
Support group (n=10)	1	3	0	2	3	2	2

6.2.15 Question C.10: Which sources do you use for study purposes? (This question applied only to respondents who were students)

At the time of the study, there were nine respondents in the **Research group** who were busy with their studies. They indicated that 'journals' were their most preferred choice of information sources used. 'Search engines' were ranked in the second place with 'textbooks' in the third place. The results are shown in Table 6.18.

Table 6.18: Sources used by the Research group for study purposes (n=9)

Information sources	Solely	Most of the time	To some extent	Not at all	Weighted index	Rank
Journals	2	4	1	2	2.67	1
Search engines	0	5	2	0	2.11	2
Textbooks	0	4	2	0	1.78	3
Dissertations / Theses	1	1	2	1	1.33	4
Databases (e.g. saved search profiles)	1	1	1	2	1.22	5
Table of Contents (TOC) alerts	0	2	1	2	1.11	6
Electronic discussion lists	1	0	1	3	1.00	7
Library catalogues	0	1	2	2	1.00	8
Personal information sources (e.g. conversations with colleagues and other experts)	0	1	2	2	1.00	8
Research reports (internal as well as external)	0	0	2	2	0.67	10
Workshop, seminar and conference proceedings	0	0	2	1	0.56	11
Annual reports	0	0	0	4	0.44	12

Note: Weighted index is calculated on a 4-point scale with weight assigned as follows: Solely=4; Most of the time=3; To some extent=2 and Not at all=1.

Except for the researcher, there are currently no personnel in the **Support group** who are enrolled in studies.

6.2.16 Question D.1: How important is the following services currently offered by the library to you?

Good library service can be seen as a gateway to good usage of a library and for the purpose of this study it was therefore very important to establish how important the patrons regard the services. The most important services were listed as shown in Table 6.19 and the respondents could choose more than one option.

The **Research group** regarded all the services as 'very important' except for 'library services and sources training', which was regarded as 'important'. This service was also chosen five (5/30) (17%) times as 'not important' and twice (2/30) (7%) as being 'not aware of'. The lending service of the library is still regarded as important, as it was indicated twenty-two (22/30) (73%) times as 'very important'. 'Literature searches' was marked twenty-one (21/30) (70%) times as 'very important'. The full results are listed in Table 6.19.

Table 6.19: Importance of current library services to the Research group (n=30)

Services	Very important	Important	Not important	Not aware of
Lending of books, journals, etc.	22	6	1	0
Interlibrary loans	13	11	2	0
Library services and sources training	8	11	5	2
Literature searches	21	7	0	0
Reference and enquiries services	16	11	2	1
Table of Contents (TOC) service	12	11	2	1

The **Support group** also indicated that they regard the 'lending of books, journals, etc.' as 'very important' as it was marked four (4/10) (40%) times. They did not regard the 'Table of Contents service' as 'very important' and it was marked three (3/10) (30%) times as 'not important'. Overall did they regard the library services as 'not important'. The results are shown in Table 6.20.

Table 6.20: Importance of current library services to the Support group (n=10)

Services	Very important	Important	Not important	Not aware of
Lending of books, journals, etc.	4	1	2	0
Interlibrary loans	1	1	2	0
Library services and sources training	1	2	2	0
Literature searches	1	1	2	0
Reference and enquiries services	1	1	2	0
Table of Contents (TOC) service	0	1	3	0

6.2.17 Question D.2: What other type of services/sources do you require from the library?

The questionnaire also made provision for other types of services that they may wish the library to offer; respondents were presented with a list as displayed in Table 6.21. They could choose more than one option and could add additional information in a separate column.

The **Research group** indicated 'access to databases available for free' as important as it was marked twenty (20/30) (67%) times; followed by 'links to search engines', marked fourteen (14/30) (47%) times and in the third place 'subscription to relevant databases other than CAB and SpringerLink, which was marked thirteen (13/30) (43%) times. 'Bibliographies' was regarded as the least needed as it was only marked five (5/30) (17%) times. The results for this question are displayed in Table 6.21.

Additional information that was added by the **Research group** was requests for the following:

- Informing authors of publication of articles in popular publications and keeping record of it; and
- Access to ScienceDirect.

One respondent specifically noted that the services and sources were adequate for his needs.

The **Support group** marked 'links to search engines' four (4/10) (40%) times, with 'bibliographies', 'reference management software' and 'training in the use of databases' only marked once (1/10) (10%) each. Two requests were added in the additional information column, which include a request for 'training in the use of search engines' as well as 'more books on human resources'. The results are shown in Table 6.21.

Table 6.21: Other services and sources required from the library

Groups	Access to databases available for free	Alerting services	Bibliographies	Links to search engines	Reference Management Software	Training in the use of databases	Subscription to relevant databases other than CAB and SpringerLink
Research group (n=30)	20	10	5	14	6	6	13
Support group (n=10)	0	0	1	4	1	1	0

6.2.18 Question D.3: Which services in addition to D.2 would you like the library to offer?

The respondents were also given the extra opportunity to add additional services which they require from the library that were not included in the two previous questions. From the two groups the following additional comments were mentioned:

Research group: Four of the respondents indicated that they were quite satisfied with the current services and sources. As for requests, the following single opinions can be noted: access to more international journals and books; a photo library; a complete collection of progress reports for each project for previous years as well as an up-to-date list of journals available in the library, in printed format; an electronic collection of all popular publications by ARC-SGI authors as this useful information can become lost when publications become outdated; computer literacy training; links to (the websites of) university libraries. On a lighter tone, two respondents wished for a coffee machine.

Support group: Two respondents requested more information regarding transport, i.e. national rules and regulations as well as a binding machine[3] in the library (each request was mentioned only once).

6.2.19 Question D.4: Satisfaction with services offered by the library

All the respondents of both the **Research group** (30/30) (100%) and **Support group** (10/10) (100%) answered this question. The respondents could indicate on a scale of 1 to 10 how satisfied they are with the library services which are currently rendered. The results are displayed in Table 6.22. The **Research group** was reasonably satisfied with the current library services as twelve (12/30) (40%) respondents gave the library a 10; eleven (11/30) (37%) respondents gave the library a 9 and five (5/30) (17%) gave the library an 8 for services received. Of the **Support group** four (4/10) (40%) gave the library a 10; three (3/10) (30%) respondents gave the library a 9 and two (2/10) (20%) gave the library a 5 on the scale. The respondents were not asked to expand on their choices and the researcher can only speculate on the results. Not all the respondents use the library services on a regular basis, which may contribute to the lower scores. In section 6.2.16 the **Support group** did indicate that they do not overall regard the library services as very important, which could explain the low score of 5.

[3] The library does have a binding machine

Table 6.22: Satisfaction with library services

Groups	Satisfied								Not satisfied	
Scale	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
Research group (n=30)	12	11	5	2	0	0	0	0	0	0
Support group (n=10)	4	3	1	0	0	2	0	0	0	0

6.2.20 Question E.1: Any other comments or recommendations you would like to add?

The respondents were given a chance to add any comments if they so wish. Their feedback included comments such as the on-going need for training and assistance; adding books on certain subjects to the library collection; and their satisfaction and appreciation for the library and its services. Additional comments by the two groups are as follows:

Research group:

Comments that were made by the **Research group** include the induction and training in the library services for new employees; two respondents stressed the importance of library services at ARC-SGI and one respondent requested that the librarian should renew borrowed books every six months.

Respondent R13 commented as follows on induction and training in the library:

> *'Induction would be very beneficial to new employees in which they can be introduced to services the library offer and how the library can do for them and what they are responsible for, e.g. photocopying, journals, etc.'*

Respondent R10 stressed the importance of library services at ARC-SGI:

> *'Although costly sustained, library information services is an absolute must for the Institute especially if the location is considered. The library does not have to stock everything, but must have access and know where to find the info we need.'*

Support group:

Comments received from the Support group include the addition of Human Resources and Administration books in the library; two respondents also stressed the importance of the library at ARC-SGI and one respondent (respondent S6) indicated that he normally finds needed information on Google and Microsoft:

'The library is offering the researchers with much needed info, but in the ICT field I normally find what I need from Google and Microsoft.'

In the next session, the interviews that were held at ARC-SGI will be discussed.

6.3 DISCUSSION OF INTERVIEWS

The interviews were held supplementary to the questionnaires to give the researcher in-depth insight in the information needs of the patrons of ARC-SGI. Some of the questions were duplicated, but the interviews gave the participants chance to express their views more freely. Scheduled interviews were held with fifteen participants of ARC-SGI. Ten with researchers, two with research technicians and three interviews with support personnel. Twenty semi-structured questions were asked to each participant and the interviews ended with one general question to give them the opportunity to add anything that was not covered by the questions. A copy of the interview schedule is added as Appendix B.

The word-for-word transcribed responses from each participant were written separately on interview schedule templates using Microsoft Word. All the comments made by die researcher during each interview, were indicated in square brackets. Thereafter, the fifteen Word documents (complete with questions and answers) were sent back to each participant via e-mail for their final approval. The approved responses were then copied and pasted into a prepared Excel document.

In the Excel document, all the questions were arranged on separate sheets so that all fifteen answers appear on the same sheet as the particular question. The participants were numbered from P1 to P15 in the column next to their names in the Excel spread sheet, but in the discussion the researcher will only refer to the participants as P1 or P4, etc. An extra column was added where the important points in the responses were highlighted as keywords. This was done to ensure that the researcher does not miss important information during the discussion.

The data collected during the interviews will be discussed according to the questions from the interview schedule. Where appropriate it will be supported by quotes from the responses from participants. Quotes form a very important part of the reporting stage, because it serves as evidence of the research (Pickard 2007, p. 179).

According to the literature it is customary to incorporate the best quote from participants if there are several that illustrate the same point (Kvale & Brinkmann 2009, p. 280). Kvale and Brinkmann (2009, p. 280) also indicated that where there are many different answers to the same question, it is useful to add several quotes that highlight the different opinions. As the evaluation of the library's services and sources are important in support of the librarian's role to render an effective service, all the different opinions of

the participants are considered valuable. Where the researcher considered it necessary, more than one quote from the participants was included in such instances. Quotes were only slightly edited to ensure good reading flow, a practice which is acceptable according to Kvale and Brinkmann (2009, p. 280).

The data collected during the interviews are discussed in the next section.

6.3.1 Profile of the interview participants

The participants in the interviews included researchers, research technicians as well as support personnel. The participants were selected out of three groups as explained in Chapter 5 (section 5.4.2.3). These groups included patrons who regularly use the library; patrons who do not use the library very often; and lastly, patrons who seldom use the library – with the main focus on the Research group. Four of the participants also form part of the Management team of ARC-SGI. The profile of the participants is displayed in Table 6.23 below with the purpose of providing general background to the results of the interviews.

Table 6.23: Profile of the participants in terms of their position in the Institute and frequency of visits to the library

Participant	Position in ARC-Small Grain Institute	Visits to the library
P1	Researcher	Monthly
P2	Researcher	Weekly
P3	Researcher	Weekly to monthly
P4	Researcher / Management	Weekly
P5	Researcher	Daily to weekly to monthly
P6	Researcher	Weekly to daily
P7	Researcher	Seldom
P8	Researcher	Monthly
P9	Researcher	Weekly to monthly
P10	Researcher	Weekly
P11	Research technician	Seldom
P12	Research technician	Monthly
P13	Facility division / Management	Daily
P14	Finance division / Management	Seldom
P15	Human Resources Division / Management	Seldom

The frequency of their visits to the library depends on their needs and varies from daily to seldom. Participant P5 puts it as follows:

> *'It depends on my needs. If I'm busy with, for instance, scientific publications it will be more weekly or daily and if I'm just doing normal research, maybe monthly more than daily or weekly.'*

Participant P15 explained the fact that she seldom uses the library as:

> *'It was a bit difficult for me. I would say seldom, once in a while, because normally the information that I access is the information which we create from our side. Like your procedures in terms of how the organisation should run, so that's why I say seldom. You would only go to the library when you get the Act.'*

6.3.2 Reasons for using / not using the library

It is important for the library to know why the patrons come to the library; therefore this question was included in the interview schedule. It was phrased as: 'Why do you use the library? / Why do you not use the library?'

According to the responses, the participants use the library for a variety of reasons. Some of them merely indicated that it was for information, which can include journals, books, Acts and articles. The library is also used when information is needed for the writing of publications, proposals and work in general. A few mentioned that they use the library to read the newspapers and to use the printing and scanning facilities. Participant P3 mentions that he uses the librarian's services to proofread manuscripts and to check the correctness of references. The researcher deemed it necessary to add more quotes to highlight the issue of library use. Participant P1 explains her use of the library as:

> *'The library, I think the library is traditionally a place where you would like to search for information. And I think our library is very well supplied with information. It's also a place to relax, but due to our activities here, that's not something that we do often. So it's basically for information.'*

Participant P4 explains use of the library as follows:

> *'I use the library to get information related to my work in general and in particular for writing proposals and popular publications.'*

Two of the participants (P7 and P11) who are not using the library, gave time constraints as one of the reasons:

> *'It's mainly a time thing. Don't have enough time to go out into the library and spend time searching things.'*

'Ok, we're very busy outside in the glasshouses, so by the time it's mark off time and the library is closed, that's when I can only come to the library.'

She also mentioned that she does not know how to use the library. Another participant does not use the library, because most of the information that she needs comes from ARC-Central Office.

6.3.3 Importance of library services

Library services are regarded as very important in a library and the library at ARC-SGI is no exception. The question was posed as: 'Which of the services the library offer is most important to you?' Options were given as: 'Circulation of library material'; 'Document delivery'; 'Interlibrary loans'; 'Literature searches' and 'Table of contents (TOC) alerting service'.

'Literature searches' and 'interlibrary loans' were regarded as the most important services followed by the 'Table of Contents services'. Participant P4 described it as:

'The ones that are most important to me are (1) interlibrary loans, (2) literature searches, (3) Table of Contents alerting services.'

Some considered all the services as important as indicated by P12:

'I think I use all the services. But the most important one to me is currently the literature searches, the interlibrary loans. And the document delivery is very nice to have, and then the one that's really important is the TOC services.'

'Document delivery' did not come out as strongly as expected, but participants could have considered it as part of 'interlibrary loans' and maybe also as a part of 'circulation of library material'.

6.3.4 Other services in the library

The next question was phrased as: 'Are there other services you would prefer the library to offer?' This question was added to give the participants the opportunity to add services which they would like to receive from the library. The researcher included more quotes to reflect the opinions of the participants. The majority of the participants were satisfied with the current services as are reflected in comments by participants P8 and P9:

'Ja [yes], I think I'm satisfied with the current service. We get all the important services we are supposed to get.'

'Not at this point in time, no.'

Participant P3 recommends that the library keeps track of funding opportunities as advertised by the NRF and DAFF in South Africa and FP7 of the European Union.

> *'I don't think you should make an exhaustive effort in looking for potential funds, but if you concentrate on the big ones, such as the NRF, DAFF and then overseas we've got what they call the FP7, which is funded by the European Union. In just to understand more or less what they do there, takes a lot of time from the researchers.'*

Participant P7 suggested that the library could send out Table of Contents of journals and articles that are focused on a specific division and their specific needs.

> *'I was thinking maybe like on top of the circulations that you send out of specific journals … maybe as a suggestion is … a division speciality, perhaps if you send out a circulation for them regarding things they might be interested in'.*

Participant P14 requested that the library circulate certain journals, for instance, the Landbouweekblad[4], to certain personnel members.

> *'I take for example … the Landbouweekblad that we get the indexes. I know at other places they actually circulate it on a list. Certain magazines, not all of them, but certain ones. …. You don't always have access … or have the time to go and sit down in the library and go through it. Whereas it came past you, maybe it would be beneficial to us all to read those articles that are there. Not just wait for the index, but it would be like a normal service'.*

6.3.5 Other sources available through the library

Currently, the library does not have access to as many databases as, for example, a top university library, but for future planning it is quite important for the library to know what the personnel would be interested in. The next question is meant to find out what is also important and useful to them: 'Are there other information sources you would prefer the library to offer? The library service currently offers: ARC libraries web page on the intranet; CAB Abstracts; Ebsco and SpringerLink'.

Nine participants expressed their satisfaction with the current services as indicated by P3 and P4:

> *'No, I'm comfortable with what you've got on here. I think the CAB and the SpringerLink are quite complete.'*

> *'So far these services meet my requirements and expectations.'*

A few other sources were pointed out by the participants and they are mentioned in Table 6.24.

[4] The 'Landbouweekblad' is an Afrikaans agricultural weekly magazine for the farming industry

Table 6.24: Other important sources to which the participants would like access to

Databases	Journals	Books
CAB e-books[5]	Australian Journal of Agricultural Science (Crop and Pasture Science)	More new books focused on specific projects
Google Earth	Finweek	
Medline	Journal of Cereal Science[6]	
ScienceDirect	Journal of Invertebrate Pathology	
Scopus		
Web of Science		
Wiley Blackwell		

Two participants (P6 and P9) also wished for electronic access to all journals appropriate for ARC-SGI:

> *'What I really wish we could have, but due to the fact that we're not a tertiary institute, I am not sure if we could get access to … basically all magazines, scientific magazines online. That would be very, very nice.'*

> *'I would very much like to have a full complement of the electronic access, which I know is pretty, bitterly expensive …'*

6.3.6 Sources used other than the library

The patrons of ARC-SGI not only use the library and its resources for information, but also make use of other resources. The next question was included to establish which sources are used: 'Which sources other than the library do you use to obtain information and why?'

According to the interviews, the sources that are used most are the Internet, Google and Google Scholar.

P1: *'Like I said, Google Scholar and I use the Internet, because that is easily accessible.'*

P2: *'Well it is mostly the Internet, because the Internet is a huge library on its own.'*

P12: *'No, I use the Internet, because it's very convenient for me. It's in my office available. … I use Google most of the time.'*

[5] Since the completion of the interviews, the ARC has subscribed to CAB e-books with access dated back to 2008
[6] ARC-SGI subscribes to the paper version of 'Journal of Cereal Science'

Participant P3 added that besides Google and the Internet, he uses Dogpile and also contact other authors for information that he needs. He also mentioned that he subscribes to reading material from other publishers for extra information. Participant P7 said that he uses article references and journal websites on top of Google and Google Scholar. Students are in the fortunate position of having access to their universities' library resources, as participant P10 indicated:

> *'I am a student of the University of the Free State, so I have access to their electronic database.'*

Participant P13 said he takes trouble with access to his information sources:

> *'I've got my own private collection of books and documentation at home. Then also I make use of bookshops, then also the Internet and lastly the local town library.'*

Participant P14 said he uses Treasury's website[7] for needed information and participant P15 said she gets some of her information through our Central Office as well as the ARC Intranet, where certain documents are stored.

The participants indicated that they use Google, because it's convenient, easily accessible and sometimes you are able to access the full text PDF version of an article. Google is also used as an entry point for many searches because it is easy to use.

6.3.7 Use of information

This question: 'How do you use the information obtained through the library services?' was to determine for what purpose the patrons need information. The main purpose was for work, which was expressed as 'work', 'projects' and 'research'. Also work-related, are the writing of publications and proposals, travel- and annual reports:

P7: *'Basically it's to get ideas of what projects are on-going around the world and what could be a good project idea and what's already been done sort of thing. And then basically that information is used to either write articles or put a project proposal together.'*

P8: *'I use it for writing, when we write annual reports, travel reports, publications, popular articles, articles for journals - we use this service, library service.'*

Two participants stated that they use information for the preparation of congresses and also for general (agricultural) background:

P1: *'The planning of research, which is very important for congresses, and just for general background knowledge.'*

[7] Department of Treasury available at http://www.treasury.gov.za

P5: *'…And then the other information, the scientific information, is used for scientific publications, scientific congresses. I use a lot of information for congresses though.'*

Participants also indicated that they use the information obtained through the library for various other reasons, namely studies, laboratory protocols and laboratory methods, to be informed about Acts, personal use, and just normal reading.

P12: *'In the laboratory itself I usually use methods - more information when I want to see if the methods that I use are ok, or when I want to use a new method and then I also use it for research for my M.Sc. studies.'*

P13: *'…firstly for my studies into the history of Small Grain Institute, then secondly for personal use, for example to keep myself updated with the daily news and then thirdly to look at, for example, some of the Acts, the Health and Safety Act and so on that is available in the library there.'*

P14*: 'Well, it's mostly just reading, that's the main use of the information, it's just normal reading.'*

6.3.8 Factors impacting on library use

In every organisation there are factors that influence the patrons' use of the library. To gain a clear picture of the patrons of ARC-SGI, it was necessary to ask the following question: 'Which factors impact on your use of the library and information sources?' According to the responses received, the answers can be divided into needs and constraints. Needs depend on the kind of work that they are currently busy with, for instance, the need for more information on laboratory techniques, for the writing of articles and annual progress reports and also the need for a specific article because of certain information in that specific article. One participant's need depends on the updated information and the frequency of the arrival of new material in the library. Their needs that impact on their use of the library are expressed by the participants as follows:

P4: *'The updated information and the frequency of getting new materials.'*

P5: *'The factor is how busy I am with research in itself. Not the literature research, but being in the field or being in the greenhouse if you don't get time to get to the library, you don't have time. So, it's on what I'm busy with at the moment. If it's a scientific publication I will use the library more often and the sources more often and if I'm busy with physical hand work, the physical work, then not maybe not so much. It depends on my daily activities or my weekly activities or the time of the year, because for instance if it's year-end, then maybe you will use the library for references for your year-end report, but if it's in the month that you do the data analysis, then you don't have time for the library, then you do data analysis. So, it depends on where you are with your report writing.'*

P9*: 'I think the one is time, because there's an awareness that you need to stay up-to-date with information and that's one that you, it's not a thing that's always a priority in your life, but*

when you got time, I've got 5 minutes, or 10 minutes spare, I will go through either the Table of Content that have been sent or I will start looking for something. Because that's the kind of job you can do in a small amount of time. But the very pressing one when you actually know there is a piece of information out there that you need to get your hands on where somebody says I've published it, it will be available soon, then you will need to get that – like there was a Journal of Economic Entomology article that you got for me…. Where I had to actually, I wanted to, I needed it. So I was like driven by the fact that I needed to know what was written in it. So, I think the, it's time and need – and between those two there's a, sometimes the need is so big that you make time and other times you wait till you have time.'

P10: *'Well, I guess it's the work I do in my laboratory. If I have a new technique I need to sort out, I first go to the library and do a search there.'*

The main constraint that was raised by the participants is time – the lack of time to visit the library. Other constraints varied among the lack of access to databases from outside the premises of the ARC; laziness to walk to the library; and one participant felt that the library is too complicated to use.

P2: *'… it's work related. And it's dependant on the trials that we do and it's dependant on the seasons as well. So, for instance during January, February and March we are busy with the glasshouse trials, and then from July onwards we are busy with the field trials, and then we're very busy. And then we don't have access, or there is no time to go to the library.'*

P3: *'Well, time is obviously of essence here, and I think that's why… to me the library services are of such value, because it saves me a lot of time, accessing the information we can direct it to you. So, it's like a one stop for accessing information. But time is probably the essence here.'*

P8: *'Well, it is important I should come to the library, but probably, like you said, time is important. When you don't have time, even if you want to come, you might not come. So, time could be a factor.'*

P11: *'Time … other than that, I find the library to be very complicated. It's not straight-forward like the Internet. Seriously.'*

Participant P13 said that his office is very close to the library, so it is easily accessible to him and participant P14 indicated that he has direct access to the books he needs, which makes it unnecessary for him to go to the library every time.

6.3.9 Involvement of the librarian

The question: 'What is your opinion on the involvement of the librarian?' was considered as necessary to test the general feelings of the patrons towards the presence of a librarian. The reactions of the participants were quite positive, which emphasise the importance of a librarian at ARC-SGI. Some of the responses are illustrated:

P1: *'I have, in my twenty years that I've been here, I have never come across something that I would ask the librarian and it would be too much trouble for her.'*

P3: *'Well, like I said it is very important to me. I appreciate the personal service that we can request you to assist us with in accessing different sources of material, publications. So, yes it is very important the involvement of the librarian. Sometimes you just cannot access through the electronic technology, you just need some human intervention at times to get hold of stuff.'*

P4: *'She is of great assistance to us as colleagues. She is always there when we need assistance from the library. She co-ordinates with other libraries for interlibrary loans. She teaches us on the recent search engines when requesting for articles and other materials. She update[s] us on the latest developments on the library world.'*

P6: *'Involvement … I would say is very, very good. If it wasn't for the librarian, I would not be so successful, I would say.'*

P7: *'I generally feel, excellent services, unbelievingly fast and friendly services. … The quicker and efficient the service, the quicker we can get on top of doing our projects and that. So, if we have to wait like a week or two for an article is something that can delay a whole project, so the efficiency of that is outstanding.'*

P9: *'I think we are very fortunate at Small Grain Institute, because Juliette is involved in the research to a large extent. I very much like the fact that she comes to all the meetings, all the report meetings. … And I think there's a very big commitment on Juliette's side to do a good job and to make sure that, the fact that we stuck out in Bethlehem, doesn't count against the researchers at Small Grain Institute. She really puts in a lot of effort and has a very good attitude to fixing people problems and getting people involved in the library.'*

P10: *'…The librarian knows where to find it. It's crucial, we can't go without a librarian.'*

P14: *'I think you're quite involved with what is going on here. I don't think there are any problems around that.'*

P15: *'Because firstly what I like about our librarian is that she goes to the people and find out what their needs are. So that she can successfully identify the clients' information and translate it into high quality information services.'*

As Bethlehem is 250 km away from the next big city with library facilities, the question confirms the importance of a library at ARC-SGI. Good service delivery is equally important and appreciated.

6.3.10 Training needs of library patrons

The training needs of the patrons of ARC-SGI were investigated with the question: 'Can you please elaborate on your training needs in terms of the following services?' The services that were mentioned were: Training in the use of databases, e.g. CAB, SpringerLink, etc.; Help with setting up a profile for alerting services; Training in executing literature searches; Training in the use of reference management software; Training in the use of search engines and Training in the use of Personal Information Management (PIM).

When analysing the results of this question it was evident that the participants considered training in all the services as important:

P11: *'I think actually everybody in this Institute needs that, except for the doctors! Do I need to choose one, or is it everything? ... I think all of them.'*

Participant P1 requested the librarian to give a short presentation on each of the services, which included a short introduction and perhaps a tip or two:

> *'I think maybe some of these things you have tips on how to use, or how to easily access something or how to use a search engine. We maybe take the long route, and maybe there are some short tips that you can offer on these things.'*

Participant P2 also requested training in all the services, but accentuated the importance of databases:

> *'Databases, I think it is really important to show them. Because sometimes most of them only know Google, and so they only work on Google and Google is not, I can almost say complete enough to give all the information.'*

Participant P3 had the following to say about Personal Information Management:

> *'And then the Personal Information Management – this is an administrative task. If it's going to be very user friendly, I'll be interested. Otherwise, it could be another time-consuming exercise. So we need to be very careful.'*

Participant P7 highlighted training in the use of search engines:

> *'And also further about training in the use of search engines – I would really enjoy going through that, because I think I am just touching the iceberg when I do searches. So, to get a broader knowledge, I would really like to get skills on those.'*

Participant P10 said that he did not need training in services other than the ones mentioned:

> *'No, in fact I saw stuff on this list that I never thought existed!'*

Participant P12 considered training in the use of databases, literature searches and search engines as 'needs' and training in Reference Management Software and Personal Information Software as 'nice-to-have's'. Only one participant (P14) indicated that he did not have any need for training in the mentioned services.

The outcome of this question showed the researcher that training is a never ending need of library patrons. The librarian should never be self-assured that the patrons already know how to use all the available services. Training is a very important aspect in any library and it is one of the issues that need to be addressed continuously in the future.

6.3.11 Relevance of the library collection

The library collection should be on par with the needs of the patrons, hence the question: 'Does the library collection meet with your information needs? Please explain where the library can expand on its collection'. The following options were added to the question: Annual reports; Books; CD's & cassettes; Farmer's day booklets; Journals; Maps; Production guidelines; Progress reports; Slides; Technology reports and Travel reports. In addition the question 'What other types of material would you recommend to the library?' were asked.

Seven of the participants indicated that they were satisfied with the current collection. Some of the responses are listed below:

P1: *'…and I think our collection is really sufficient, it's really up-to-date, and everything that you need is in there. So, there is nothing that I would like to add to that.'*

P9: *'I think Small Grain's library has got a very good collection.'*

P10: *'I think the library collection meet the information I use. … I am really satisfied with that. I've never came back empty-handed from the library.'*

P13: *'No, I think I am of the opinion that the current collection is quite complete. I think we've got some old, or archive material as well as active and more contemporary material.'*

The participants also made a few recommendations. Participants P2 and P3 pointed out that the collection of the annual reports (progress reports) is not complete in the library. When a new person starts at ARC-SGI, they are usually referred to the progress reports for background to the project they will be working on. The library can also strive for a

more complete collection of the travel reports, or currently called, the Back to Office Reports, as these sometimes contain valuable information.

Participant P4 expressed a need for journals in the management and extension field, as the library is lacking in these two fields. He also recommended that the library expand on its CD collection and lastly that the library try to keep up with new developments and technologies in the information world in order to stay in touch with international libraries.

Participant P5 recommended that the library update the Weed Science book collection with maybe one or two books each year to stay in touch with new developments:

> *'Books are difficult, because there are always new books and that's why there's a library. You never stay up-to-date, every day new books comes out and it's the researchers' job to make sure that the librarian knows of books that comes out and that's needed. … So I think books, we can actually expand in my field a bit, especially new books, up-to-date books. We've got a lot of books that's older that contains herbicide names and stuff that's maybe out of date.'*

She also referred to books that were previously published by the Department of Agriculture, commonly known as 'Bot se boek' (a book written by an author named Bot), which were of great value to them and has not been updated recently. She also pointed out that Back to Office Reports are very valuable to the library collection.

Participant P6 suggested that the library send out notices regarding the collection of CD's, as they tend to forget that it is available in the library. He voiced the need for the library to house photographs in electronic format to be easily available to everyone:

> *'I was wondering, but this ... could be a very troublesome one, is the collection of electronic photographs in the library available for people, but I think that could be very difficult for you to collect from people, because everyone has its own collection of photographs.'*

Participant P7 suggested the expansion of the CD/DVD collection in terms of modern agricultural techniques, with the inclusion of biotechnology, especially because it is now a very relevant topic. Participant P8 expressed the need for electronic maps of the country and the whole world:

> *'I don't know like maybe the maps, if you can get easily accessible electronic maps of the country, the world - that will be good.'*

Participant P9 indicated the need for more complete access to electronic versions of the journals. Participant P11 mentioned that she would like the library to house DVD's that visually explain how certain techniques work as she remembers from the university. It

would also be very useful to show the junior personnel what they would like to achieve in the glasshouses.

> *'… one other thing that I remember from varsity, … there's a specific technique they would actually make it a video. And it would make sense much more, simpler and very understanding for us…. So, they will take their job very seriously, knowing where it is going.'*

She also expressed that it would be nice if the library could keep a few novels – just for enjoyment and to de-stress.

Although the participants overall seemed quite satisfied with the collection, some additional points were made to enhance the collection. These include a complete collection of annual reports and travel reports; journals in the field of management and extension; updates on certain books, CD's and DVD's; as well as an electronic collection of photographs in the library. The latter can easily be managed using the Inmagic genie cataloguing system.

6.3.12 Topics covered by the library

Due to the nature of a research library certain topics are covered in the library which should be adequate for the needs of the patrons. The following question was included to establish if the current topics indeed satisfy the needs of the patrons: 'Do the topics covered by the library meet with your expectations and on which topics should the library expand? Currently the library covers Biological control, Biological farming, Biotechnology, Crop protection, Ecology, Entomology, Financial management, Human resources, Plant breeding, Plant pathology, Plant physiology, Soil cultivation, Soil fertility, Statistics, Strategic management and Weed science.'

The responses from the participants indicated that they were in general satisfied with the current topics covered by the library as is expressed by the following:

P1: *'So, they are up-to-date, and all the topics that I need. So there's nothing that I would like to add to that.'*

P5: *'So, for me it is actually quite sufficient at this stage.'*

P12: *'I was quite surprised when I saw the topics that are already covered. I think we have a wide range of information and I am satisfied with the current content of it.'*

There were also a few very good suggestions made by some of the participants for expanding the subject coverage. Participant P6 said that one topic he could recommend the library to expand in, is 'conservation agriculture'. He mentioned the possibility that it may be covered under 'crop protection' or 'biological control'. Participant P7 added that

although 'biotechnology' is covered, it will be good to expand on its current collection. It is a new field at ARC-SGI, but the potential of the subject is multiple.

> *'… they are all overlapping into biotechnology and applications and it's no longer like if you just buy a biotech book it's applied to biotech. Actually it can be a broad field, a broader spectrum now of what they actually apply biotechnology to anything ...'*

Participant P8 mentioned that the library should expand on 'agricultural extension', as this is an important field at ARC-SGI. Participant P9 indicated another important topic, namely 'molecular genetics':

> *'I think the field that the library is maybe a bit lacking in is the molecular genetics. And I think that is due to the fact that we have never really had a very active programme on that. … So, I don't think we've got a gaping hole at the moment, but it might be a good idea to start looking at basic books on molecular genetics.'*

Participant P13 suggested that the library can expand its collection to include more material regarding the history of the agricultural science as well as in facilities management:

> *'In terms of expansion I think the library can look at, say, more at history in terms of agricultural sciences and also in my field of specialisation in facilities management. Facilities management is quite a new science, and I think we need to get more material on facility management.'*

6.3.13 Physical facilities in the library

The library should be a place where the patrons would like to visit and feel comfortable to spend time. The following question was asked to learn what the participants thought of the current facilities: 'Do the physical facilities in the library meet with your information needs? Please express your opinion on the following: Size of the library's information sources; Shelves; Display areas; Reading areas; Lighting and Power sockets for laptops.'

The size of the library and the space available are foreseen as a problem in the future. Some participants commented on the space that should be improved in the future as indicated by P13:

P13: *'Ja [yes], I think we had this discussion also a couple of times at the library meeting, but I think, we're fine, except that somewhere along the line we are going to … run out of space.'*

There is a need for more shelves as indicated by a few participants such as:

P12: *'I think maybe there can be in future a problem with the shelves. I think you will need, especially if we get more books or more journals, I think it is possible that we should look in the future for some extra shelves.'*

Some of the participants suggested that there should be more heat during winter time in the library:

P2: *'Can I add that it is very cold? We need to do something about that. You cannot work when it is cold.'*

Another area that will need some attention in the future is the need for more comfortable reading space where researchers can relax as indicated by some participants:

P1: *'I would like to see more relaxing areas with facilities that researchers can use. That can make it more user friendly, perhaps.'*

P5: *'But ja [yes], it's maybe something we can actually look at to do a modern reading corner. Some people prefer bean bags and stuff like that. Maybe make a little reading corner with bean bags and a little table to work on and a chair or two, but make it more comfortable.'*

P14: *'I think again we're fine you know, … in the future it would be nice if you have like a reading room where you could actually – not sit around the table, but you could actually go and sit there lunchtime and read the newspaper. You got that, but it could be a bit more informal if you want to put it that way.'*

Two participants, P4 and P6 suggested more effective lighting in the library:

'… and you also increase the lights, the light facilities in there.'

'… maybe between the shelves the lighting could be better.'

Participants P4 and P15 suggested that there should be single spaces or cubicles available if people feel the need to sit and read by themselves undisturbed:

'But at the moment the tables are very few and I would suggest that you put up cubicles in the library … because they have got some walls on the side and then in front. You can't see the other person sit on the other side. So, the disturbance is minimal, in that case.'

'If we can have single spaces where a person can just sit and study and read whatever material that they need to access from the library.'

The building in which the library is stationed, is currently experiencing structural problems that need to be addressed in the future as have been highlighted by participant P13:

> *'We're going to look at maybe the background in terms of the structural problems that we experience with the Ernst Pieper Building, the cracking of the building as well as the problems with the foundations. We are going to look at other alternatives for future use.'*

Power sockets for laptops did not seem to be a problem for the participants. Most of the personnel at ARC-SGI have desktop computers in their offices, which eliminate the need for power sockets in the library. There are, however, a few personnel members who do not have computers to their disposal in their offices, and these members can be accommodated in the library.

P5: *'… power sockets – I don't use a laptop in the library. So, I haven't ever looked at that.'*

P6: *'Power sockets for laptops could be a problem, but I don't think there are so many people using laptops in the library. So, I don't think it so a very, very big need.'*

P9: *'…the power sockets for laptops – I don't think we don't have that many laptops in and around, so it's not really necessary. Everyone's got a desktop.'*

A few of the participants were quite happy with the current facilities:

P3: *'Yes, I am quite happy with the shelves and the display area, the reading – we've got comfortable tables there, I know it's been used for small conferences. I do not foresee any problems there.'*

P10: *'I think the library is well … the layout is friendly, user friendly and there is enough space between the shelves, the books are well displayed. And there are sufficient tables and chairs if you want to sit and read.'*

6.3.14 Additional physical facilities

The question 'What other physical facilities would you like to see in the library?' was asked to provide the opportunity for participants to add to the current facilities. Their recommendations can be used to improve on the facilities and transform the library into a more user-friendly environment.

One of the aspects that were raised by the participants is the need for more heating in the library. The library does have oil heaters, but the participants' reactions revealed that this is not enough.

Two participants (P2 and P11) confirmed that air conditioning will help to solve the problem:

P2: *'… you've got heaters, but that is not effective. Air conditioning? … that would be great!'*

Participants P4 and P7 also suggested separate cubicles with computer facilities that can be used by personnel who do not have access to computers in their offices:

P4: *'Maybe you can also increase the number of computers, for those people who don't have the computers in their offices; they can use the computers in there for various purposes.'*

P7: *'…one or two cubicles where you can actually play a DVD or a movie or the TV and headphones and listen that way in front of like a TV or something like that, for if you want to learn something quickly, and or you don't have the facilities at home, or something like that, and you could do it here or at work.'*

Participant P12 recommended that one or two leads should be available if needed by patrons:

> *'The other thing, there's a lot of power sockets for whatever you want to need it, but maybe it will be good to have one or two leads available in the library if somebody will need it. It's just a recommendation.'*

Participant P11 suggested something completely different. She wanted a 'noise room' in the library as they had at the university where she studied. In this 'noise room' the students could do want they wanted to – she used it to study out loud:

> *'More like a reading room for noises, where everybody does their thing out loud.'*

Lastly, on a lighter mode, was a suggestion for coffee facilities in the library:

P1: *'I would like to see a coffee machine, or something like that.'*

P9: *'A coffee corner!'*

All of the suggestions and recommendations showed a tendency towards the more modern approach to libraries, where the patrons can gather in a more informal and relaxed atmosphere. This view is supported in the literature where the 'information commons' idea is gaining momentum (Bailey 2006; Heitsch & Holley 2011).

6.3.15 Marketing of library services

Marketing of library services always play an important role in any library; therefore the following question was included in the interview schedule: 'What is your opinion about

the library's efforts in promoting the library services (e.g. the use of e-mail notifications, scientific seminars, and displays in the library)?'

In general, the participants felt that they are satisfied with the current methods of promotion that the library uses. A few recommendations have been made regarding the above-mentioned methods and a few new methods have been suggested, the latter which will be discussed in the next paragraph, point 6.3.16.

The satisfactions of the participants are recorded below:

P1: *'…the information that you distribute on a continuous basis and the seminars that you organise and remind people about things that is happening in the library; new books that arrive at the library and seminars that we present. Well, once again I can't criticise anything of that; you do a tremendous job there.'*

P2: *'I am satisfied about the way that you promote the library services.'*

P3: *'I think your e-mail notifications are quite adequate in promoting the library and what services. You do notify us about you know, access to databases like CAB, new passwords coming through, what the ARC's negotiated. So, that's the most important one to me is the e-mail notifications. And obviously the scientific seminars, which you chair most of the time. That also promotes the library, in that sense. I'm quite happy with that.'*

P4: *'…I think the library is doing very well as far as information, you know, the dissemination on new things are concerned and we are very much satisfied with that.'*

P5: *'The seminars I know the librarian really tries hard to organise seminars, especially before people go to congresses. At least that people can have a trial run. Just interest sake, seminars that's not scientific, but the librarian also organise it, travel seminars, interesting stuff that actually can take you away from your work and just relax you for a bit and stuff like that. So, that's actually quite nice.'*

P6: *'I think your e-mail notification and scientific seminars are good and I am not sure that really big displays in the library are really necessary. I think that shelf with the theses and the new books are, I think that is enough.'*

P8: *'We get every information we need from the library. Through e-mails and other ways, through display like when we get the deal. That one is satisfactory.'*

P9: *'I think our library does it well, we have a - it's a fine line between pushing so hard that you become a menace and pushing to be visible and I think we do it exactly right. There aren't too many e-mail notifications, but there are enough that you know there is always something happening. And the e-mail notifications are always sensible, so you don't sort of think, oh it's from the library; just delete it without reading it – which does happen when people overuse that facility. And then, as I said, the displays are good.'*

P12: *'I think the people at the Institute are really aware of the service itself and the importance of it. Your current efforts are very effective. The one thing that is always important when you deliver a service is that a good service sort of sells itself and I think the service over the years were really very good. So, I think it is currently still adequate.'*

P14: *'We do a lot of effort there, especially with scientific seminars.'*

P15: *'I think at this stage the librarian is doing quite a good job in terms of those, of informing us via e-mail notifications. Anything and everything with the services of the library, we get frequent e-mail notification. I am happy with the way things are done.'*

Participant P11 was not quite impressed by the library's methods of promotion:

> *'Well I think the e-mail notifications are not working very good. Talking from experience, I open it, like the library; no I'm not going to read that. Close it. Sometimes it's just a long story, when am I going to finish reading, I don't even understand what's going on here.'*

Recommendations were made regarding the current methods of promotion, in particular the displays and seminars. Participant P1 suggested that the new books should be displayed separately from the rest of the shelves where it is clearly visible when you enter the library:

> *'… we can have a smaller shelve or a section or a table where the newer books can just be displayed on an area, an open area, not part of the shelves, the shelves of the library itself, but more on an individual basis apart from the others. That you can, when you go into the library you can see this is the table with the new books.'*

Participant P5 suggested that the displays can be expanded to include special days of the year:

> *'Displays in the library, maybe if it's water week, we can do a water display something or if it's World Aids Day, we can do a little AIDS display in the library or if it's, but, for Valentine's Day there's always little hearts. … but if it's World Heritage Day, then maybe we can do a little, for a week we can do a little display. Even if though it's only a small tree and a little plant or something.'*

Participant P13 added that the library could use the current displays available at ARC-SGI and display it from time to time in the library:

> *'We've got quite a number of posters that's available if you walk through the corridors on the walls. There is quite a variety of posters, why not take some of the posters from time to time and display it in the library. And also going for … new displays.'*

Regarding the seminars, participants P4 and P7 urged for more scientific seminars on a more regular basis:

P4: *'I believe that we really need to have regular seminars for scientists, so that they can get used to presentations and different presenters.'*

P7*: 'I definitely think that there's a scope for more marketing. … as an Institute, we need to press for more scientific seminars. I think it's a great idea that on Friday's, but I think it should be every Friday, or every second Friday, because it's the only chance that we'll learn further as a scientific community and get to know what each other are doing. … and it gives a lot of scientists who don't get to go to conferences a lot get that exposure and confidence before they go to conferences.'*

6.3.16 Additional marketing strategies

The participants shared their ideas regarding other marketing strategies during the interviews. This included library days, reviews of new books, posters, research forum in the library, awareness of library material, general discussions, notice boards, and using the telephone as a method of promotion. Participant P4 suggested open library days where people from outside ARC-SGI are invited and introducing them to the library and its services:

' … maybe we can organise library days like once a month, once a year and then invite people from other institutions around Bethlehem to come and see what we have and how we can make use of the library. Particular to those people who are involved in agriculture. There are some other people who are studying agriculture through part time and I believe they still make use of the library.'

Participant P6 suggested more attention to promote new books. This can be done by asking a knowledgeable person to write a review and also to advertise the book at seminar gatherings:

'[The] next few books are on display at the library, it's new books and … maybe you can ask someone to do a short type of review – maybe you can ask people to do one or two reviews on new books, just to promote new books. Or you can even do it at a seminar.'

Participants P7, P13 and P15 further suggested that the library can make use of posters (notice boards) to promote services and events of the library:

P7: *'I'm always a firm believer in posters like it's amazing how visible, for example, the blood donor posters are that's just on the doors before you get in. If you just put a flyer up there I think that would give a great, a lot of more interest on like if you have something, an event or something like in the library.'*

P13: *'Maybe one can also look at notice boards, because not all the personnel have access to e-mail and I think … the aim should be to also look at your lower post level personnel and also involve them in the information access.'*

P15: *'As I said earlier that I am also going back to the notice boards. For people more especially who do not have access to e-mails. To access the information that's available in the library on the corridors or everywhere.'*

Participant P7 also proposed a forum where general discussion can be held on topics that are of importance to the researchers at the Institute:

> *'And another suggestion if you would do on a monthly basis would be, … like a general discussion or a forum where you possibly send out a circular e-mail and say you want suggestions from the scientists on which popular, or which new developing article would be of great interest to this Institute or this scientists. You set a time, maybe just half an hour or an hour and you all go sit in the library as a forum and we discuss what the people did in the article and how we can learn from it or how we can adapt it into our sciences and stuff like that.'*

This idea links with the suggestion made by participant P14 on general discussions on agriculture at ARC-SGI:

> *'… we can have like a general discussion on things happening. Because now we sit like for the Farmer's Day – what's happening in agriculture, in wheat? Like this year, everybody says it's dry; we're not going to plant. But, what alternatives are there? What shall we maybe be concentrating on, while it's dry and we are not going to plant? Just having like a general discussion.'*

Participant P14 also mentioned that the library can start a kind of awareness service, where the personnel are made aware of newsworthy items in the different sections and also link current articles in popular magazines to information already available in the library:

> *'I think there we could make aware of certain things, you know. Say, in an e-mail, have you read this person's abstract. … maybe, this week take Crop Protection, or Weed Science, and focus on that. …. Say there was this article in the Landbouweekblad, for more information regarding these things, we got the following books in the library. You know, just maybe just hook on what is current affairs in the Landbouweekblad or Farmer's Weekly or in the newspapers.'*

Participant P5 said that the library can even phone her if we came across something that would be of interest to her:

> *'You can phone me if you find something important that you think I need. Especially if it's something that you find quite interesting. … Even though I maybe already have it, you will never know maybe I don't have it.'*

All the new recommendations can be summarised as:

- Separate book displays;
- More seminars;
- Open library days;
- Book reviews;
- Posters / Notice boards;
- General discussions / Researchers' Forum;
- News awareness service;
- Telephone notices; and a
- Coffee machine.

6.3.17 Preferred methods of promotion

The participants were asked to state their preferred choices of promotion in the question: 'Which methods of promotion would you prefer?' E-mail notifications were by far the most preferred choice of promotion – fourteen of the fifteen participants indicated e-mail notifications. Some of them also added the Table of Contents service, seminars and displays:

P2: *'I think e-mail; with e-mails it is easier to get hold of people because they are not always in the offices.'*

P5: *'I use the TOC's, the e-mail notifications a lot. E-mail actually, because all the scientific seminars, everything comes through on e-mail. So, the e-mail system works quite well and you've got a reference to go back to.'*

P6: *'I would prefer the e-mail notifications and seminars.'*

P7: *'Just for convenience sake, I like, I enjoy the e-mails. The e-mails are just practical and when I pop in the office, they're there. So, that's the best form for me, anyway.'*

P9: *'I like getting the e-mails and I like getting the, I like the seminars. As I said I like the displays of the new books when you go in and you could actually see what it is. And I think the promotion that works for me … is the fact that our library has information, not only for scientists, but for the electrician and for the man who needs to read the newspaper and we've actually got quite a broad content that pulls in people of all disciplines on the research*

station. And that makes the library alive. You can come and just read the Landbouweekblad if you want to.'

P13: *'No, I think the current methods are quite adequate, especially the e-mail notifications. That's the way to do it.'*

P15: *'I prefer e-mail notification, because I've got access to e-mails, so I think it's really working for me.'*

Participant P11 acknowledged that she liked the idea of the 'snippets' we have on our Intranet, where there are published short news reports on current events with photographs:

'Intranet. If it would be in your face, maybe it will always trigger something. … I think you guys had a conference in Pretoria, or some workshop, then there were pictures and I was interested in the story. That was kind of like interesting. … it made me want for more, read for more.'

6.3.18 Trends in the agricultural environment

There are certain topics and issues in a research environment that libraries, serving that community, should be aware of contributing to a more effective service to its patrons. The following two questions addressed those issues. The first question was aimed at the agricultural environment and the second one at more general trends. The first question read as follows: 'Which trends in the agricultural environment should the library note in order to improve its services and collection?' and the second question: 'Which trends in the South African and international society should the library note in order to improve its services and collection?'

In an agricultural environment it was natural for the participants to think with agriculture at the back of their heads, therefore many of the issues that were identified as important in the first question were also considered as important in the second question. These mutual issues include:

- Climate change;
- Food security;
- Global warming;
- Biological control;
- Sustainable agriculture; and
- GIS (Geographic Information System).

Various issues that are mentioned as trends in the agricultural environment are amongst others: water conservation; information regarding farming communities; integrated pest management; and agricultural technologies.

Participant P1 mentioned climate change, food security and water conservation. Besides climate change, Participant P2 regarded information regarding farming communities and the Umlundi newsletter as important:

> *'I think we should, or you should be informed that what's going on in the farming community. There is also the Umlundi newsletter … most of the researchers receive that, but I think it is good for you to keep that as well in the library, because some of the people don't have access to computers as well, so maybe you can print out the document and keep that.'*

Participant P3 added to global warming the issues surrounding biological control and integrated pest management and also future agricultural technologies:

> *'Then, specifically for my work in biological control and integrated pest management. There's quite a global move or trend towards these methods of control. … Future agricultural technologies … there's a document that was requested by the Stellenbosch University, or that's been put together by Stellenbosch University on future agricultural technologies being developed. I think that will give you in a nutshell … where the new agricultural technologies are heading.'*

Participant P4 stressed the fact that the library should stay on top of new electronic technologies available in the library environment and that we should constantly learn from other libraries – national and international:

> *'In this case I think the library should follow the trend of other libraries. It's like most of the libraries now have shifted to electronic equipment. And I am not sure as to which equipment is now being used … but then if we can always try to keep abreast with the other library equipment used by the other libraries, which would be fine. … particularly other libraries here, locally, nationally what they are using.'*

Participant P5 named herbicide resistance as an important aspect in her field:

> *'The biggest thing at this stage in my field is people looking at herbicide resistance … they are now looking like the influence of global warming: is the herbicide resistance shifting due to that.'*

Participant P6 accentuated climate change and food security:

> *'… climate change I definitely think would be a good one and at this stage food security.'*

Participant P7 highlighted the issues surrounding biotechnology and agricultural technologies:

> *'… on a slightly smaller scale the application of biotech. …The technology is pushing agriculture into a more of an automated high-through-put system and that's definitely the trend that we need to investigate in. Definitely.'*

Participant P8 mentioned biotechnology; global warming; sustainable agriculture and GIS (Geographic Information System).

Participant P9 stated that agriculture in South Africa is moving into Africa and we need to be aware of that and be prepared to act accordingly:

> *'I think the trend in South African agriculture … is that it's expanding into Africa. And if we want to stay relevant we are going to have to broaden our mind-set to actually cope with the fact that people are marketing South African cultivars in Africa and they are being grown there and there's information that might need to go with that. So, the whole agriculture in South Africa is becoming agriculture in Africa.'*

Participant P10 suggested that the librarian should be aware of new hot topics in the agricultural environment and inform the researchers as such:

> *'There I would say 'hot points', for instance Ug99 if there is a new rust that may hit us in South Africa and cause major crop losses, which if the librarian picks it up, it will be good to inform us'.*

New, relevant books in the library were considered as very important to participant P11:

> *'I think if they could get the recent publications and books, then that will really benefit us. Specific to us'.*

Participant P12 mentioned that the economy and food security are issues that the librarian need to be aware of:

> *'I think there is currently world wide a huge emphasis on economy, so that's really important. The other thing that is really important is the role of – especially wheat – in food security and in food security in Africa.'*

Participant P13 regarded agricultural history, climate studies and agricultural economics as important issues:

> *'As I have already mentioned I think agricultural history is quite a new focus. Then also climate studies, in terms of climate change. It's a new topic and maybe also agricultural economics.'*

Participant P14 considered the fact that farmers are trying to be economically sustainable as notable and important:

> *'The guys are definitely looking at different ways to make sure that they are sustainable in the long term, economically sustainable.'*

Participant P15 thought that libraries need to continually adapt to new trends and technologies in the agricultural as well as the library environment:

> *I thought about the fact that technology plays an important role in our lives today. And the development of the facilities in the library according to the changing trends and requirements. I don't know how to put it, but as technology moves, the library should also adapt to whatever changes are there in the agricultural environment. …You've got a screen where you can go, you ask that screen where you can get such information. Even when she's not in the library, you know you're able to access information.'*

The trends in the agricultural environment that the library should take note of to improve its services are summarised as:

- Climate change;
- Food security;
- Water conservation;
- Farming communities;
- Umlundi newsletter;
- Biological control / integrated pest management;
- Future agricultural technologies;
- Electronic technologies in libraries;
- Electronic books and devices;
- Herbicide resistance;
- Biotechnology;
- Global warming;
- Sustainable agriculture;
- GIS (Geographic Information System);
- Movement of agriculture into Africa;
- 'Hot topics';
- New, relevant books;
- Agricultural economy;
- Agricultural history; and
- Economically sustainable farmers.

6.3.19 Trends in the South African and international environment

Participant P1 expressed two concerns as trends which the library should take note of and that is the fact that less land is available for commercial farmers as well as that wheat production is slowly decreasing:

> *'I think in South Africa maybe the thing that concerns researchers most is – maybe on a political side – that less land will be available in future for commercial farmers, on the one hand, and I think on the other hand that, the fact that wheat production is slowly decreasing – due to the fact of maybe wheat price, maybe it's the result of a lot of other reasons.'*

Participant P2 suggested that the library should be informed about conferences and congresses that are important to the researchers and then be able to inform researchers accordingly:

> *'It's good to be updated on all the international conferences or workshops, even local workshops or conferences that are going to take place.'*

Participant P3 recalled the issues regarding global warming, food security and biological control:

> *'Yes I think again it's the whole issue of global warming, food security, biological control, the movement away of environmentally harsh pest control strategies. Those are all issues we are confronted with. Insect pest resistance developing against chemicals is quite a hot topic, also in South Africa.'*

He also suggested that the library keeps the Crop Protection section informed on the activities of IRAC (Insecticide Resistance Action Committee):

> *'… and perhaps we can, you can keep the Crop Protection section updated on activities by IRAC. It's a very active group of people.'*

Participant P4 suggested that the library should subscribe to other library societies, nationally as well as internationally. Collaboration between libraries could be explored, with visits where information can be exchanged. The library may benefit a lot through these collaborations.

Participant P5 felt that the researchers should play an active role in informing the librarian on current events that is important to them:

> *'I think every researcher in his field must update the librarian about new trends, because they shift yearly, they shift seasonally and then if they do their job the library will actually improve its collection, because we will obtain new material. And it's services, because we will have a broader knowledge of everything that's going on.'*

Participant P6 argued that the library should be aware of trends in crop production and food security:

'… so internationally, I would say you should look into what is the international trends in crop production and what are forecasted would be in future the need, the food security need, I would say for the world population. Something around that maybe you should be aware of.'

Participant P7 elaborated on the fact that South Africa can be more competitive if there are more effective collaborations among researchers. He explained that in overseas countries you will notice that many researchers will jointly publish an article or work on a conference paper.

> *'I think again it's just South Africa to become competitive internationally we just got to get up to speed at what's being done internationally. And us working in smaller groups is not going to get us very far and internationally there are these huge collaborations. And the library I think needs to make our scientists aware of certain … you go to conferences internationally and there's sometimes 20-30 authors on a title page and they have another 20 or 30 people that they mention in their acknowledgements. And that's why they can take on these massive projects, it's not just 2 or 3 people doing their entire project. So, that's I think where we need to make awareness of that.'*

Participant P8 repeated the same issues as in the previous question, namely biotechnology, global warming, sustainable agriculture and GIS.

Participant P9 stated that one of the trends the library should take note of is the use of modern technology and gadgets in agriculture:

> *'I think the biggest one there is the use of information systems and gadgets. A lot of the research institutes internationally are moving to collect their data on smart phones and tablets. And that trend of having information in a digital format and having it available at the touch of a button, I think that's something that's not going to change. And I think that's going to be the key for us.'*

The second trend that she mentioned is the adding of supporting data in journal articles where raw data is made available to readers of the specific article:

> *'The other trend that is interesting is that in terms of journals. Many, many journals are now accepting what they call supporting information. So you have your manuscript, but then you have a whole load of annexures that are added on. And the other big trend is actually to load in those annexures is to load raw data and then people can download the raw data and add different sets of data together and do what they call meta-analysis. … And that kind of information is going [to] make the gap between the developed and developing just bigger and bigger. Because the people who've got the resources and the equipment to do that, are going to get further ahead much faster and the guys who don't have it are going to lag behind.'*

Participant P10 thought it would be good for the library to be aware of new trends in crop production as well as the industry's needs in terms of milling, baking, processing and legislation:

> *'New trends regarding the production of wheat or crops as well as the industry's needs, say for instance milling and baking, processing needs. … new legislation as well.'*

Participant P12 placed the focus on more biological methods in farming and organic farming, which is a quite current topic today:

> *'I think there is currently a huge trend towards a more green agriculture, a more biological one. … And I think even organic farming is an important trend that the librarian should be aware of.'*

Participant P13 stated that the library needs to be aware of the upcoming commercial farmer and the small scale farmer who features quite prominent in South Africa today. He also added food security, which is very important for the small scale farmer:

> *'… in terms of the South African agriculture, you can look at the new upcoming commercial farmer, as well as the small scale farmer. I think it's currently a new focus area in South African agriculture and I think we should make a focus of it in the library. Ja, also in terms of food security. I think, you know, the building blocks of it are basically food security.'*

Participant P14 said the focus of the library is on the electronic environment and that is where the library should expand in the future:

> *'Everything is going to be electronic, … So I think in the long term that's going to be a trend where you're not going to have maybe a physical collection that's so big, but your electronic collection is going to be big.'*

Participant P15 argued that the library should negotiate with libraries, national and international for access to information for free.

> *'… negotiate access with other organisations or institutions across the country, to access information not by being paying for specific fees, because sometimes when you go to the Internet you want to access such information, then you are required to pay a specific fee or a subscription or something. If you, we are able to negotiate with other countries or other South African libraries to access information in that sense. I think it will really assist.'*

The main points communicated in the trends in the South African and international environment are recapped below:

- Less land for commercial farmers;
- Decreasing wheat production;
- Agricultural conferences / congresses / workshops;

- Global warming;
- Food security;
- Biological control / Integrated pest management;
- IRAC activities;
- Funding opportunities;
- Library societies and collaborations;
- Researchers should keep the librarian informed;
- International collaborations between researchers;
- Crop production;
- Biotechnology;
- Global warming;
- Sustainable agriculture;
- GIS (Geographic Information System);
- Agricultural information systems and gadgets;
- Supporting information in journal articles;
- Industry's needs;
- Biological farming methods;
- Organic farming;
- Upcoming commercial farmers;
- Small scale farmers;
- Electronic environment in libraries; and
- Negotiations with other libraries for free access to information.

6.3.20 Additional information to the interviews

The participants were again given the chance to add anything they felt was not covered by the interview and that they would like to add. In general the participants felt that they had said everything they wanted to and expressed their satisfaction with the library and its services as indicated by the following quotes:

P1: *'Juliette, I would just like to thank you for your dedicated service. If I talk to other researchers at other institutes and I see the problems that they experience with the librarian and the positive attitude that you have towards the researchers and the general knowledge that you have about research that is going at Small Grain Institute. I mean, you know the topics by heart and you know if you come across interesting and relevant information, you know exactly to whom to direct that. That is not something that everyone can do. So, thank you very much for that.'*

P3: *'Well I can only support the function of the library. I think it's very important, I benefit a lot from the services that you give. The interaction we have, I appreciate that. And then also …, the speed of delivery, I must congratulate you and thank you for delivering and assisting as soon as humanly possible. Other than that, I don't have much to add, thank you.'*

P8: *'No everything is covered, I think. And in my opinion the service which this library is giving to researchers is very, very good. It's excellent service. We get everything we need. If you go to even the universities, it's not more than that. You know what to give to researchers. We have all the topics, important topics. I think we don't need other additional information if you continue like now in providing the information in the titles. So, the library is a good one, in my opinion. All the information is available.'*

P10: *'Yes I think maybe this is the right point to say that this library is highly functional and we are glad to have such a facility on our premises. And I think it's due to the librarian'.*

P15: *'I'm happy with the library service, the information that we are currently receiving and the librarian is doing a great job.'*

6.4 CONCLUSION

In this chapter the results of the questionnaire as well as the interviews were discussed in detail. Forty questionnaires were received back and analysed. In some of the questions, the Support group were discussed separately from the Research group to ensure that the results reflect correctly.

Fifteen interviews were held and all the questions were discussed individually. Very good feedback was received from the questionnaires as well as the interviews which will be used to improve the services of the library of ARC-SGI.

In the next chapter, Chapter 7, the proposed service model for an agricultural library will be discussed.

CHAPTER 7

PROPOSED SERVICE MODEL FOR AN AGRICULTURAL LIBRARY

7.1 INTRODUCTION

In Chapter 6 the data from the questionnaires and the interviews were analysed and discussed. In this chapter a model for an agricultural library is proposed, matching issues raised in previous chapters and the data analysis.

The problem statement in Chapter 1 (section 1.7) was:

> 'What should a service model look like that can direct the changing roles of libraries and librarians to be successful and effective in rendering services to researchers and other patrons in an agricultural research environment, with special reference to the ARC-SGI?'

According to this statement the focus in an agricultural library should be on delivering an effective service to the patrons. To do that, a library needs to have access to an appropriate amount of information sources, should be able to deliver services that are relevant to the patrons, and match their information needs. It is also essential that the librarian has an in-depth knowledge of the library patrons, their information needs and information seeking behaviour. In addition to the above, librarians need certain skills and competencies to execute their work in a satisfactory manner and to render the service that is required and expected. As it is important that a library should continuously adapt to new challenges and developments, the monitoring of changes in the library environment is also reflected in the model.

In this chapter the proposed service model for an agricultural library will be discussed. Firstly, a basic model will be illustrated (Figure 7.1), where the components of the model reflect the research questions set for the study. Each of these components will be discussed briefly leading to the proposed service model (Figure 7.10). Thereafter, each of the components of the service model will be explained to demonstrate a clear and understandable picture of the proposed model (Figure 7.10).

7.2 STARTING WITH A BASIC MODEL

Several models of information behaviour (often focusing on information seeking) are found in the library and information science literature. In Chapter 3 (section 3.3.2), a few models were discussed, namely Wilson's models of information seeking behaviour, Dervin's sense making model, Ellis's model of information seeking behaviour and Kuhlthau's model of information seeking behaviour. Other models that have also been identified in the literature are Bitso's (2011) information service model aimed at secondary level geography teachers, Du Preez's (2008) model of information seeking

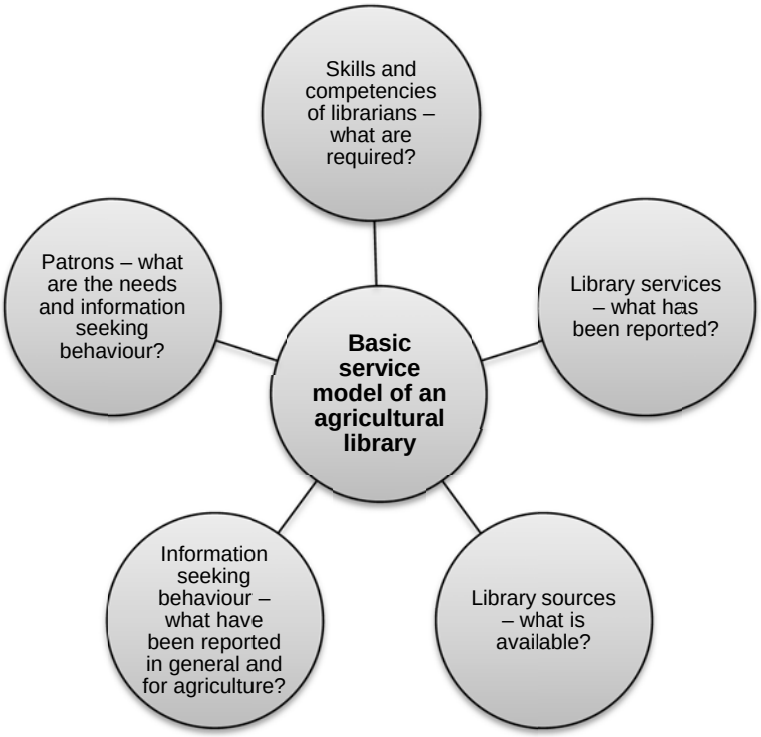
behaviour of consulting engineers and Lagzian, Abrizah and Wee's (2013) model for digital library critical success factors. According to Wilson (1999, p. 250), most models in information behaviour are statements (or sometimes diagrams) attempting to describe an 'information-seeking activity, the causes and consequences of that activity, or the relationships among stages in information-seeking behaviour'. The models found in the literature, such as 'information behaviour', 'information seeking behaviour' or 'information searching' models, differ in complexity and the detail that they demonstrate. Investigating the various models made the researcher more aware of the information needs of the patrons and focus on specific feelings in different stages of their research. To illustrate the development of the proposed service model in a clear way, it is easier to start with a simplified version of the model.

The following research questions were set for the study in Chapter 1 (section 1.7.1):

1. What have been reported with regard to the services offered by agricultural information services in the context of developed as well as developing countries?
2. What are the needs and information seeking behavioural patterns of the researchers and other patrons of the library?
3. What competencies and skills do librarians need to effectively execute their role in such a research environment?
4. What should a model for an agricultural library in contemporary South Africa be like to keep track of international trends, changing patron needs and information behaviour?
5. How can the changing role of librarians be incorporated in such a library?

Bearing this in mind and the contents of Chapters 2-4 and 6, the following basic service model (depicted in Figure 7.1) is proposed. The basic service model has five components, based on the first three research questions. The last two research questions are discussed in section 7.3 and will be incorporated in the full service model. Following a brief discussion of the components, this model will be elaborated on to develop the full service model presented in Figure 7.10.

Figure 7.1: Basic model for planning a service model of an agricultural library reflecting the research questions posed for the study



To be effective, such a model for planning a service model should:

- Acknowledge the vision and mission of the parent organisation;
- Ensure to monitor trends by means of alerting services;
- Ensure on-going surveys to monitor changes in patrons' information needs and information seeking behaviour; and
- Allow for opportunities for librarians to gain the required knowledge and skills needed.

An agricultural library that is part of an organisation is bound to follow the trends set by the parent organisation. The mission and vision of the parent organisation will therefore be honoured by the library within the organisation. The mission of the ARC is as follows (also mentioned in Chapter 1 (section 1.3)):

> 'The Agricultural Research Council is a premier science institution that conducts research with partners, develops human capital and fosters innovation in support of the agricultural sector' (ARC Strategic Plan 2010/11 – 2014/15, p. 21).

The vision of the ARC is:

> 'Excellence in research and development' (ARC Strategic Plan 2010/11 – 2014/15, p. 21).

The vision of the ARC libraries is formulated as:

> 'To be a future driven knowledge and information partner in research, development and technology transfer, adding value to the ARC and its stakeholders in South Africa and the African continent' (ARC-LIS Strategic Plan 2010, p. 5).

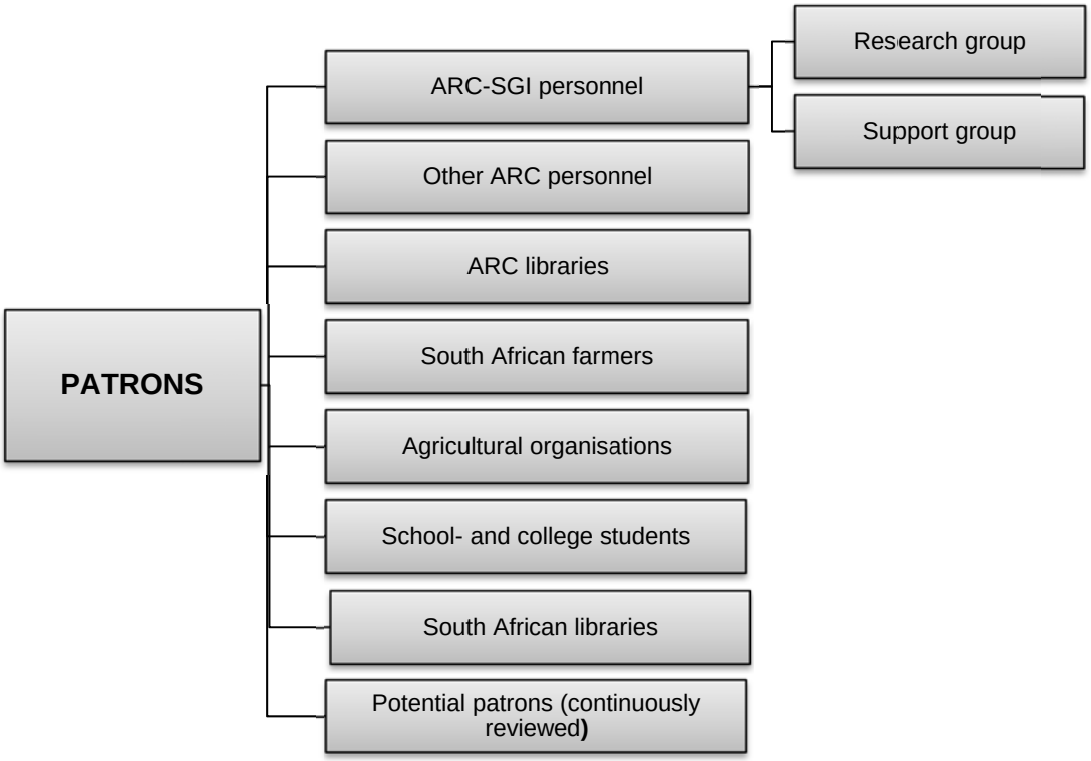
In the next paragraphs the different components of the model for planning a service model will be discussed, starting with the patrons of the library.

7.2.1 Patrons of the library

The first step in planning a service model for a library is to identify who the patrons of the library will be. They may include individuals, organisations, societies as well as members of the public.

As illustrated in Figure 7.2, the patrons of the library of ARC-SGI are the personnel of the Institute, personnel members of other Institutes of the ARC, other ARC libraries, people from agricultural organisations; school and college students; farmers and also other libraries in Southern Africa. The service model should also provide for potential clients or patrons, who in future, might make use of the library.

Figure 7.2: Patrons of the library



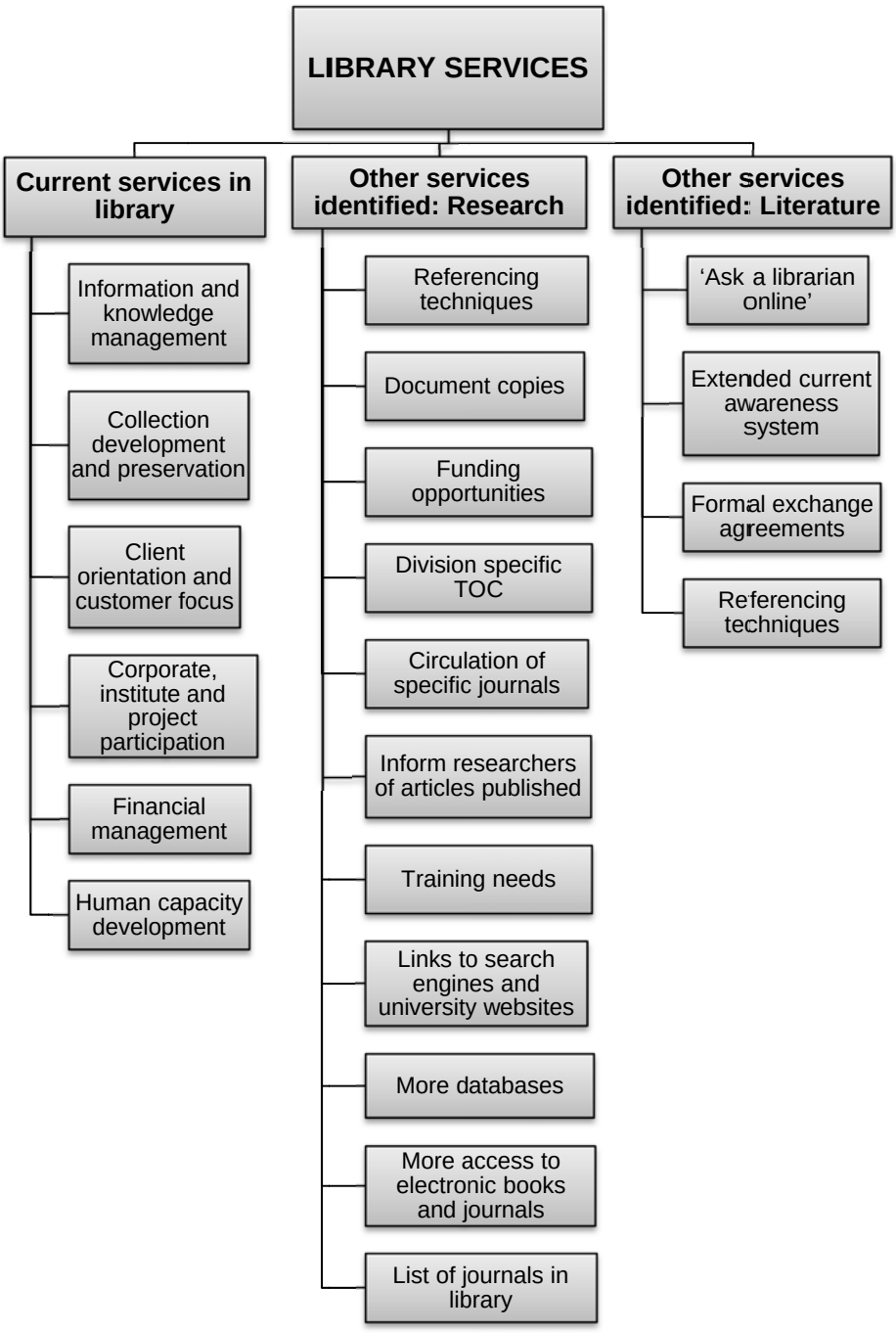
The most important patrons of the ARC-SGI library are the personnel members of the Institute. For the purpose of this study they are divided into the Research group and the Support group. Not all of them are stationed in Bethlehem, some of them are located in Stellenbosch, Riet River and Vaalharts. The librarian should always be open to potential

new patrons, such as other agricultural libraries in Southern Africa that could make use of the library. Patrons' information needs and preferences have a directional impact on the role of the library and the services that are expected from the library (Ilesanmi 2013, p. 6). Studies on information seeking behaviour as discussed in Chapter 3, as well as Chapter 6, can shed valuable insight on the needs, preferences and expectations of patrons.

7.2.2 Services of the library

The services that the library offers are very important and are discussed in Chapter 2. (In Figure 7.1 services and sources are combined. However, for purposes of discussion they are dealt here under two separate headings. Information sources are discussed in section 7.2.3). For the development of a service model it is important to incorporate the current services of the library as well as services found in the literature. New developments should also be taken into account. The information that is offered by the library is needed by the researchers in various stages of their research, as well as other tasks - as noted in Chapters 2 (section 2.2) and 3 (section 3.3.2.3). The needs and preferences of patrons for services also need to be established (as reported in Chapter 6). Services to be offered by the library are based on the current services available in the library, services identified in the literature as well as services noted in the empirical component of this study. When all of the above are taken into account, a library can be in a position to make informed decisions regarding the best services to its patrons at any given point.

Figure 7.3: Services of the library



7.2.2.1 Services available in the library

Duties and services that are currently available at ARC-SGI are broadly categorised as information and knowledge management; collection development and preservation; client orientation and customer focus; corporate, institute and project participation; financial management; and human capacity development. Specific services and projects under each category are as follows:

- Information and knowledge management

This category includes information retrieval; document delivery; lending of material; and current awareness services.

- Collection development and preservation

This category includes acquisitions and maintenance; weeding and binding; and cataloguing and classification.

- Client orientation and customer focus

This category includes client/product communication; needs assessment; and orientation and training.

- Corporate, institute and project participation

This category includes compliance with Health and Safety regulations; organising of seminars; library- and other committee meetings; ARC-LIS participation; ARC-SGI Farmers' Day; the library automation at institute level as well as library services to researchers at ARC-GCI, Potchefstroom.

- Financial management

This category includes budget compilation; budget control; and capital expenditure planning.

- Human capacity development

This category includes self-development and professional status.

The duties and services offered by ARC-SGI are summarised in Chapter 2, Table 2.1.

7.2.2.2 Services as identified during the research

The results of the empirical study, as discussed in detail in Chapter 6, showed that the patrons were quite satisfied with the services currently rendered at the ARC-SGI library. The questionnaires showed that the Research group regarded almost all the available services as very important, especially the lending of books and journals and literature searches. The Support group regarded the lending of books and journals as very important. Additional services were mentioned by the two groups and are recorded in detail in Chapter 6 (sections 6.2.17 and 6.2.18).

In essence the services that were important to the participants are literature searches, interlibrary loans and Table of Contents services. The participants added a few services that they would like the library to offer. These include assistance with referencing techniques; copies of documents; awareness of funding opportunities; division specific alerts for journals and articles; the circulation of certain journals; and to inform researchers of the publication of their articles in popular publications and keeping record of it. The participants also indicated that they need training in the use of databases and

search engines, alerting services, executing literature searches, Reference Management Software as well as Personal Information Management.

7.2.2.3 Services as identified in the literature

The services reported in the literature are discussed in Chapter 2. A few of these services were at the time of the study not available in the library of ARC-SGI. These include a 'question and answer service', an 'extension of the current awareness service', 'formal exchange agreements' with other libraries as well as 'support with referencing standards'. Implementation of these services might prove to be an advantage to the patrons of the library.

Continuous revision of the library's services and consideration of the information needs of the patrons are extremely important for the following reasons:

- Turnover of personnel at the workplace make regular needs assessments necessary;
- The librarian needs to be aware of and adapt to the changing needs of the patrons; and
- The librarian needs to be informed of new global trends and services to improve the current services.

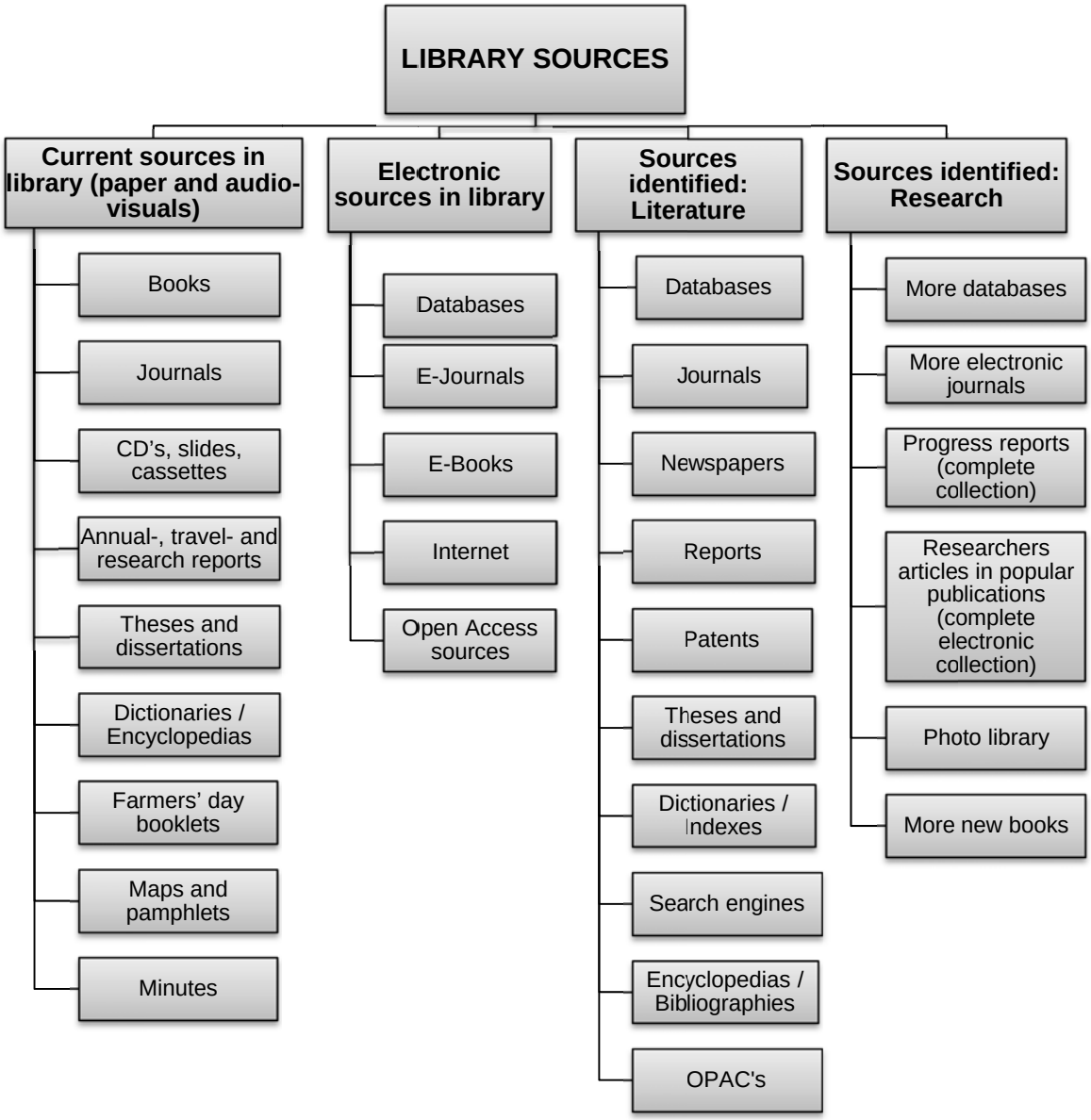
The library should include all three of the components regarding the services in order to fulfil the vision of the ARC libraries: '*To be a library of the future, which serves the scientific and business information requirements of a dynamic Agricultural Research Council'.*

7.2.3 Information sources of the library

The information sources that are available through the library play an important role in the effectiveness of the library's services. Information sources are needed by the patrons as well as the library personnel. Patrons need information sources to do their work and the library personnel needs the sources to render services to all of its patrons. The researchers should be informed of the latest developments in their respective fields to comply with the vision of the ARC: '*Excellence in agriculture of research and development'.*

The information sources that are available in the library can be divided into sources (paper and audio-visuals) that are currently available in the library; electronic/online sources that the library subscribes to; as well as other available electronic sources that the library has access to as demonstrated in Figure 7.4. The last category is the sources that were identified by the respondents during the empirical investigation.

Figure 7.4: Sources of the library



7.2.3.1 Information sources available in the library

The sources that are currently available in the ARC-SGI library are specified in Chapter 2 (section 2.4.1) and include annual reports, books, dictionaries, CD's and cassettes, theses and dissertations, encyclopedias, Farmers' Day booklets, journals, maps, minutes, pamphlets, progress/project/research reports, slides, technology reports and travel reports. These sources are mostly paper copies including a few audio cassettes.

At the time of the empirical investigation, the ARC subscribed to a number of databases, which include CAB Abstracts, Sabinet and SpringerLink.[1] The ARC also holds a free subscription to JSTOR via their Developing Nations Access Initiative. The journal

[1] After collecting empirical data, the ARC added CAB e-Books, BioOne, ISI Web of Science, Nature, OECD, Science and ScienceDirect to its subscribed E-content.

subscriptions include a number of electronic titles and also one electronic format manual on methods.

The ARC-SGI also has access to other sources, which include the Internet, databases and open access material.

7.2.3.2 Information sources as identified during the research

The results of the questionnaires and the interviews, as discussed in Chapter 6, showed that the researchers are fairly satisfied with the current sources available, but they indicated that more databases and full text articles are needed. Two databases that were identified by the research group as important are ScienceDirect and JSTOR. At the time of the investigation, the ARC did not subscribe to ScienceDirect, but considered it for the future. During the interviews the participants identified a number of databases, journals and books they would like to have available in the library. These sources are listed in Chapter 6 (sections 6.2.17 and 6.3.5).

To effectively plan for the future, the library should keep in mind the existing available sources as well as the sources that were identified in the empirical investigation. It is important for the library to continuously monitor the information needs of the patrons as it is with the services. As described in Chapter 2 (section 2.5.1.4) the librarian registered with different publishers to stay updated with new journal issues and books published.

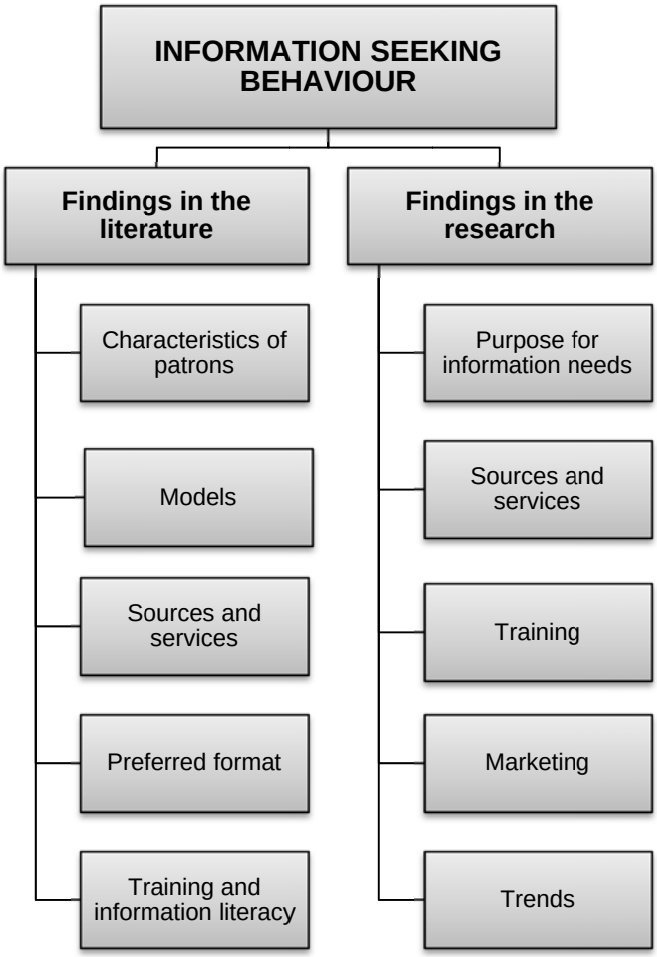
7.2.3.3 Information sources as identified in the literature

Some of the sources noted in the literature include magazines, journals, databases, newspapers, research reports, patents, theses and dissertations, dictionaries, indexes, abstracts, books, yearbooks, Internet, search engines, libraries, OPACs, colleagues, encyclopedias, bibliographies and web pages (Nwagwu 2012; Shafi 2008; University of Virginia Tech 2013). More detail on library sources is available in Chapter 2 (section 2.4.1).

7.2.4 Information seeking behaviour

Information seeking behaviour covers the second research question of the study as it is essential for librarians to know their patrons and to know what their information needs are in order to support their mission of rendering effective services.

Figure 7.5: Information seeking behaviour



The investigation into the information seeking behaviour concentrated on what was prominent in the literature and secondly, what was found during the empirical study.

7.2.4.1 Findings in the literature

Several studies regarding information seeking behaviour were discussed in Chapter 3. The points that featured quite prominently are the points illustrated in Figure 7.5, namely the characteristics of patrons; the different models of information seeking behaviour; information sources and library services; the preferred format of information; as well as the training of patrons and information literacy.

For the purpose of this study the information needs and information seeking behaviour of the patrons around the world are very important and is discussed in detail in Chapter 3 (section 3.3.3). The results differ from study to study and it depends on the different stages of research. Information sources that turned out to be preferred were journals, books, personal conversations, databases and the Internet. Scientists visit the library for the purpose of research proposals, the writing of research reports, browsing through journals and the borrowing of books. Services offered by the library, for instance, current awareness services are regarded as important to the patrons and it also appears that the patrons are not always aware of all the services offered by the library. They also

indicated that training in the use of the library's resources and services are very important.

Rural farmers preferred the radio, television, word of mouth, hands-on demonstrations and printed information, especially if it is written in their own languages.

7.2.4.2 Findings as identified in the empirical research

An investigation, consisting of a questionnaire and interviews, was done to gain in-depth knowledge of the patrons of ARC-SGI. Valuable information regarding the patrons and their preference for sources was collected through this investigation.

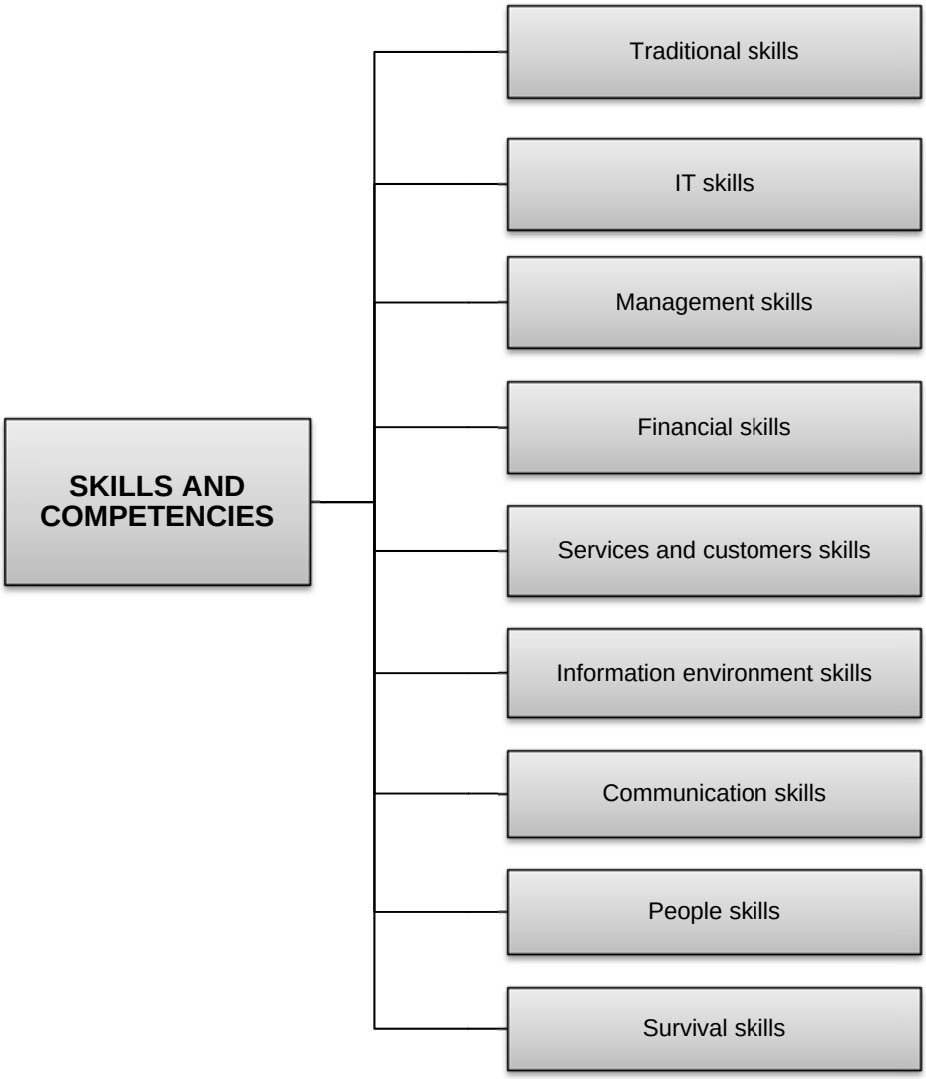
The outcome of the empirical investigation among the personnel of ARC-SGI is discussed in detail in Chapter 6. For the service model it is important to highlight the different points of the information needs and information seeking behaviour of the patrons. These are pinpointed as the purpose for their information needs; the sources that they normally use and what are important to them; what current services of the library are important and what they would like the library to offer; their training needs regarding different sources and services; how the library should market itself; and lastly, agricultural and other global trends the library should be aware of.

The information needs of the patrons are mostly work related and depend on projects that they are currently involved in. Training is regarded as very important by all the patrons and should not be neglected. To be visible at all times, the library should follow a marketing strategy that does not annoy the patrons, but keep them interested in the library. The librarian should be aware of trends in the agricultural world as well as the library environment to deliver an effective service.

7.2.5 Skills and competencies of the library personnel

The role of the library personnel in the activities of a library can never be underestimated. They are responsible for the provision and maintaining of the library sources as well as the services that is rendered. Since the advent of the Internet and the accompanying IT technologies, the role of the staff members has changed to adapt to the new circumstances. The attitudes of library personnel contribute to the success of the library. The skills and competencies are the third research question of this study and are discussed in Chapter 4. Figure 7.6 illustrates the skills and competencies needed by library personnel.

Figure 7.6: Skills and competencies of librarians



According to the literature consulted, two main categories of skills were recognised, namely professional competencies and personal competencies. Professional competencies are skills such as traditional skills; IT skills; management skills; financial skills; services and customer skills; and skills in the information environment. Personal competencies are skills such as communication skills; people skills and survival skills. What came through very strongly in the research results is the impact and importance of softer skills such as professional attitude; work ethics; personality and people skills (see sections 6.2.19 and 6.3.9). This view is supported by Mi and Gilbert (2007, p. 49) during a study done at the Medical Library at Providence Hospital in Michigan, Detroit where the library staff were considered as professional and the most-liked aspect of the library.

As indicated in Chapter 4 (section 4.1) the skills identified are applied generally to all librarians and not specifically to librarians in the agricultural sector. It is also very important to monitor future changes in the skills and competencies required of librarians in order to keep current and to stay in touch with the ever changing environment of the library.

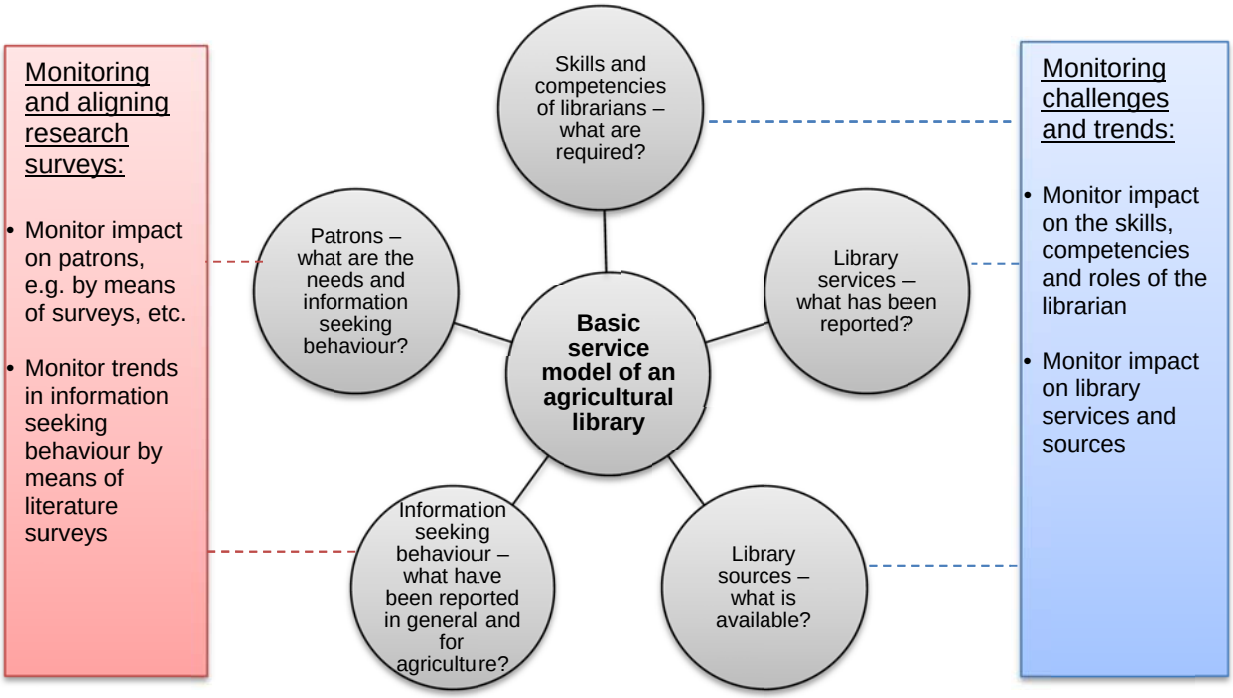
For the librarian of the ARC-SGI library this is a very important aspect. As the library is staffed with only one staff member as well as the fact that the library is approximately 250 km away from the nearest city, the librarian should be extra careful not to stagnate, but to put extra effort in to keep up-to-date with new developments. Through the librarian's skills and competencies the library's activities are promoted to the patrons and also results in more effective services.

The components that were discussed for the planning of a service model can also be interpreted as essential components of such a service model. There are, however, also additional components as discussed in the next section.

7.3 ENHANCING THE PLANNING OF A MODEL FOR AN AGRICULTURAL LIBRARY SERVICE

In the previous sections the components important to the planning of a service model were discussed according to the first three research questions. To answer the last two research questions, it is necessary to investigate the challenges and trends in the agricultural as well as the library environment. The librarian also plays an important role in these environments, which should be noted too. In the next two sections, these issues are discussed. In Figure 7.7 the basic model is slightly adapted to incorporate the last two research questions.

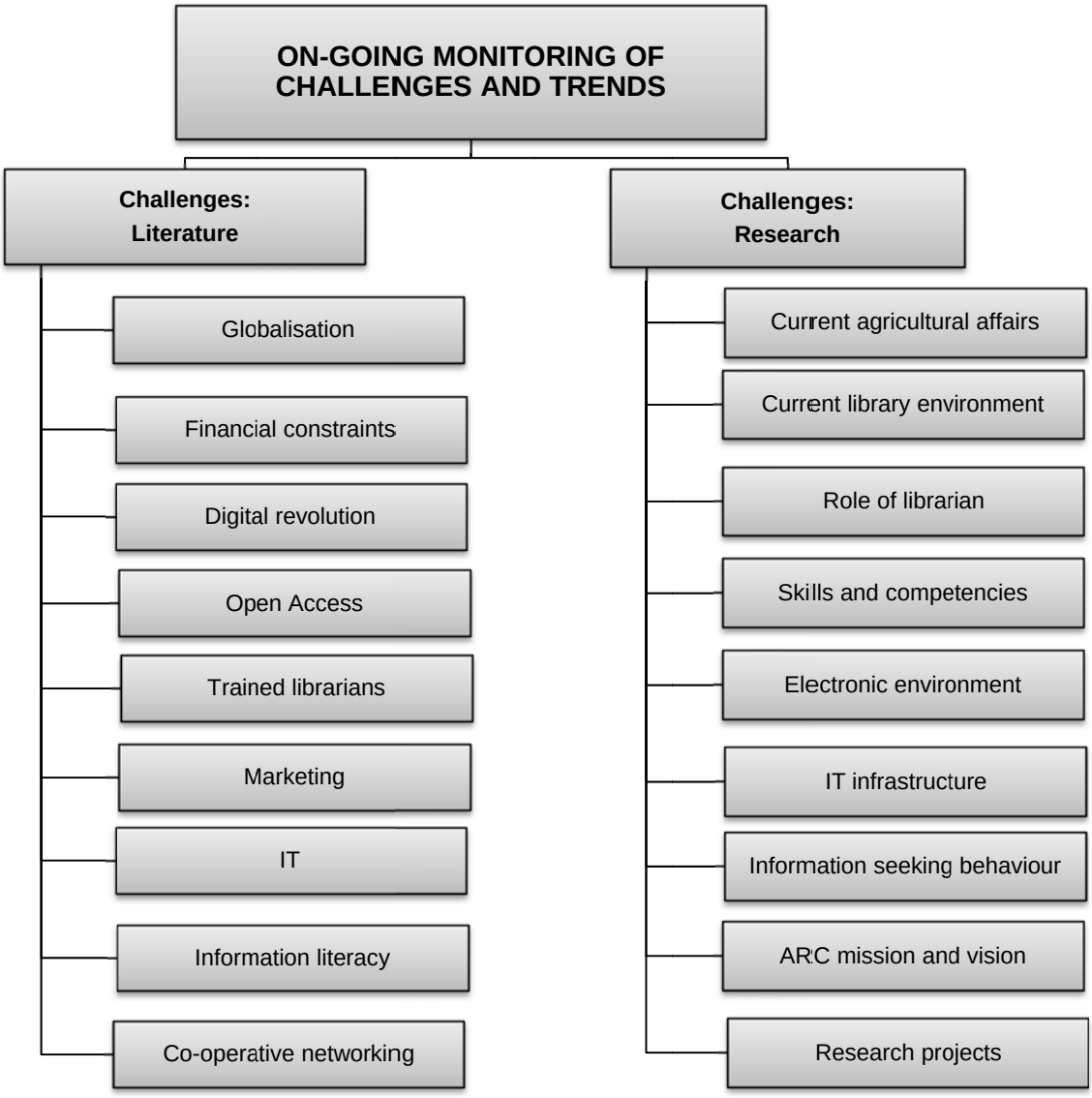
Figure 7.7: Adapted basic model for planning a service model of an agricultural library reflecting the last two research questions posed for the study



7.3.1 On-going monitoring of challenges and trends

As stated in the previous paragraphs, it is clear that the library should continuously monitor changes and challenges to stay in touch with all aspects that could promote the effectiveness of the library. Challenges facing libraries, including agricultural libraries, are discussed in Chapter 2 (section 2.6). Certain trends and challenges were also identified during the empirical investigation and are discussed in Chapter 6 (sections 6.3.18 and 6.3.19). These challenges and trends are displayed in Figure 7.8 below.

Figure 7.8: On-going monitoring of challenges and trends



The challenges that were identified in the literature are globalisation; financial constraints; the digital revolution; Open Access; appropriately trained librarians; marketing of the library; IT developments; information literacy and co-operative networking. The digital revolution includes its impact on journal subscriptions, book formats and the preservation of information and archiving.

The interviews that were conducted at ARC-SGI during the empirical research revealed that the patrons expected the librarian to be informed about current agricultural affairs and topics, as well as in the current issues in the library environment. These expectations are captured in Chapter 6 (sections 6.3.18 and 6.3.19).

Challenges also include the changing roles of the librarian, accompanied by the skills and competencies of librarians as well as the electronic environment. The latter include online databases, journals and electronic books. It is also important to be updated on IT infrastructure and developments that can be implemented in the library. The librarian should take note of studies that are done locally and worldwide on information seeking behaviour in order to stay in touch with the patrons needs. The mission and vision of the parent organisation in which the library is functional, should always be taken into account as well as the research projects that are currently running at the institution.

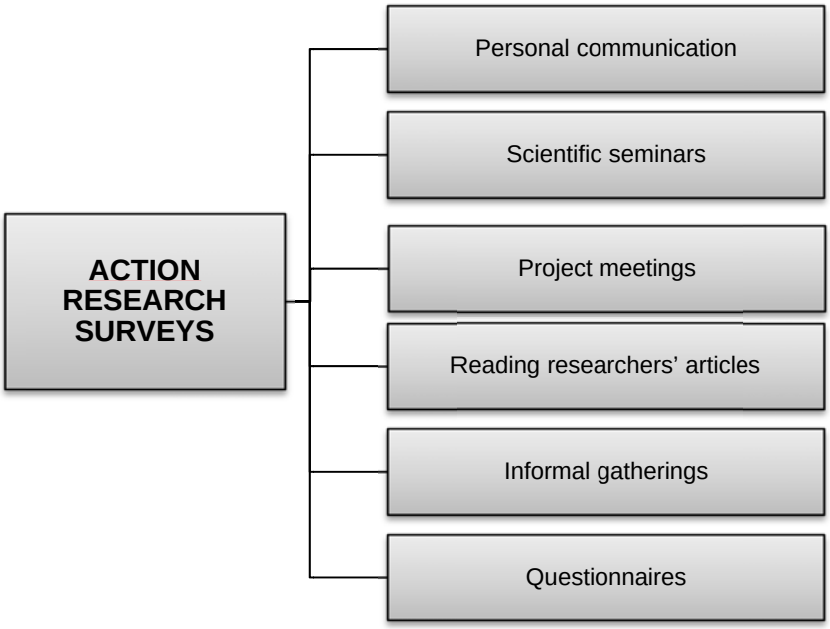
By combining the challenges identified in the literature and the challenges and trends identified during the empirical research study, the library will contribute to its mission, which is to serve the ARC and to be a library of the future.

7.3.2 Action research surveys among patrons

During this study two methods of data collection were followed. Firstly, questionnaires were sent out to all the personnel of ARC-SGI and secondly, interviews were held with a selection of the different groups within ARC-SGI. Valuable information was gathered regarding the information needs and information seeking behaviour of the personnel for the purpose of improving the services and sources of the library of ARC-SGI.

The methods of surveys suggested in Figure 7.9 reflect the empirical investigation for this study, the researcher's own experience at the ARC-SGI library as well as the knowledge already gained regarding the patrons.

Figure 7.9: Action research surveys



It will be necessary in the future to conduct surveys on a regular basis to stay in touch with the needs of the patrons. This will ensure that the services of the library stay on par with the needs of the patrons and that the services and sources can be adapted accordingly. Regular surveys will ensure that new personnel members' needs will also be taken into account.

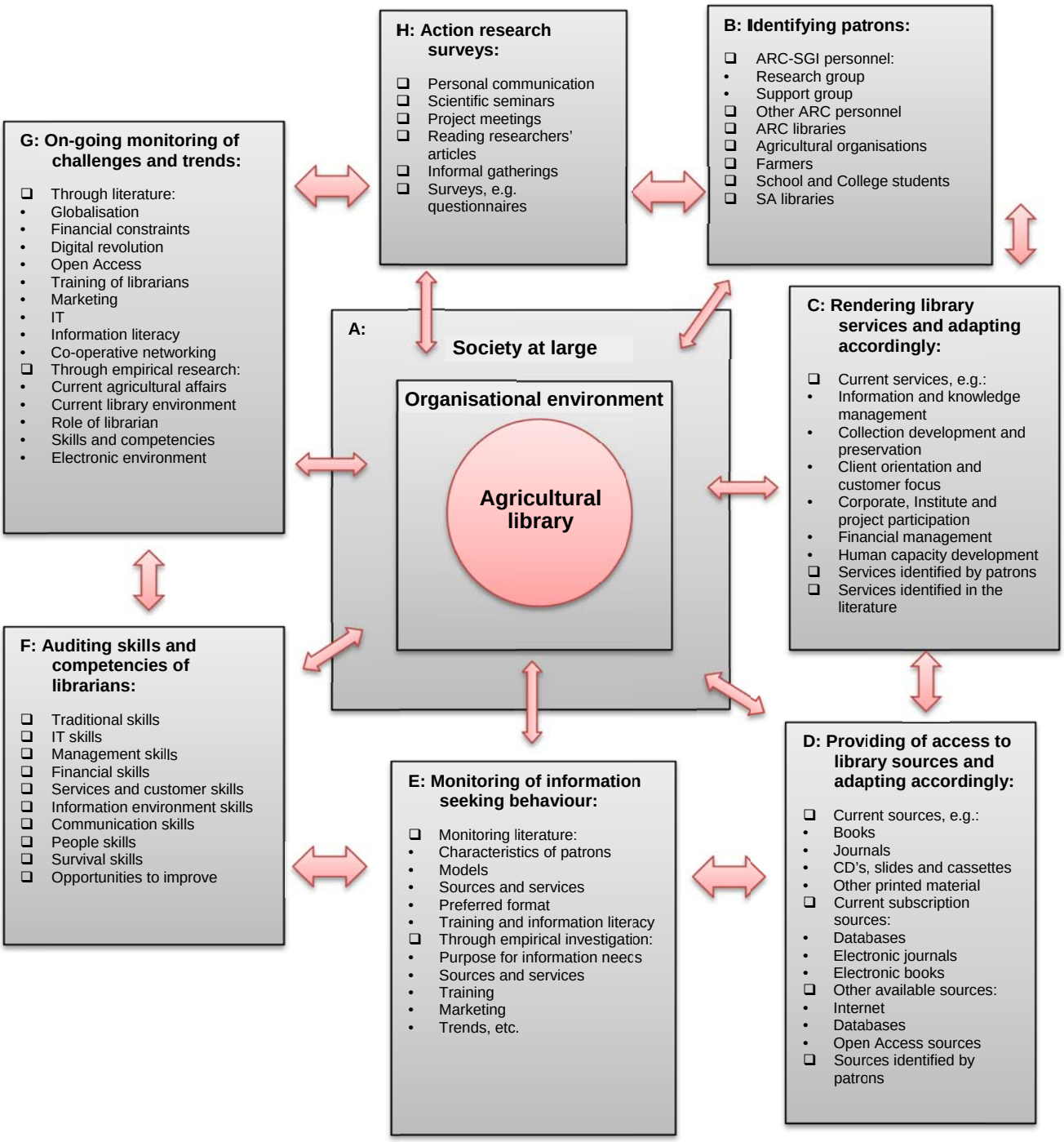
As ARC-SGI is a rather small institution, there are different ways that the patrons' needs can be monitored. These methods may include personal communication, scientific seminars, attending new projects meetings, reading of articles published by patrons and through informal gatherings. Questionnaires and or interviews can be repeated every few years for a general overview. Action research can be applied to monitor the patrons' needs on a continuous basis. As clarified in Chapter 5 (section 5.2.1.2), action research is described as when applied research addresses a problem in one's own work environment with the purpose of solving a specific problem (Leedy & Ormrod 2005, p. 44). Examples of action research are that of Sharp (2006) as well as Somerville and Brown-Sica (2011). The librarian plays an important role in the monitoring of the patrons' needs.

In the next section all the components will be put together to develop a new proposed service model for an agricultural library.

7.4 PROPOSED SERVICE MODEL FOR AGRICULTURAL LIBRARY INFORMATION SERVICES

The components for the planning of a service model are now reinterpreted to propose a service model for an agricultural library as illustrated below in Figure 7.10. The model is discussed in the following paragraphs.

Figure. 7.10: Proposed service model for agricultural library information services



All the components of the model are been coded, from A to H, to simplify the discussion. Components B to H represent the current situation in the library, findings in the literature as well as the empirical investigation that was done at ARC-SGI. The model illustrates that component A represents the environment in which the library functions. It is nested within the organisation, or the parent company, with its own unique vision and mission, and the candidate parent company in turn forms part of the society at large. Component A is central to all the other components and portrays that the library needs components B-H to deliver an effective service as indicated in the problem statement in Section 7.1. The components are all interdependent upon each other and each play an important function in the model.

Component B, the patrons of the library - especially the research personnel of the ARC - is the main reason for the development of library services. The outcome of the study was aimed to enhance the satisfaction of the library patrons of the ARC-SGI as specified in the problem statement in Section 7.1. Although the other patrons mentioned are not the main concern of the ARC-SGI library, they will all benefit from a good functioning library in the region.

Components C and D point out that the services and sources are essential in the proposed model as these are fundamental to the library and its patrons. Knowledge about the patrons' information seeking behaviour is reflected in component E, which reveals the patrons' preferences and needs as seen in the results of this study. Component F reflects the importance of librarians' skills and competencies needed to execute their job efficiently. Component G stresses the importance of the library to continuously monitor current challenges and trends in the library environment as well as the agricultural environment. Component H concludes the circle and reflects the methods that can be used by the librarian to keep in touch with the patrons needs in a continuous matter. The components in Figure 7.10 are briefly described in Table 7.1.

Table 7.1: Components of the proposed service model for agricultural library information services

COMPONENT	DESCRIPTION	REASON FOR INCLUSION IN THE MODEL
A: Library environment	The environment in which the library functions: the parent organisation as well as the society at large	To demonstrate the importance and environment of the library
B: Library patrons	The patrons are the people who use the services and sources of the library	The library was established to fulfil the needs of the patrons, especially the Research and Support groups of ARC-SGI

C: Library services	Services that are currently available at ARC-SGI library, services identified as important by the patrons and the services that are identified in the literature	Library services are an inseparable part of the library
D: Library sources	All the different sources that are available to the patrons of the library	Appropriate library sources are needed to deliver an effective service to the patrons
E: Information seeking behaviour	Information seeking behaviour describes important aspects found in the literature and highlights the needs and preferences of the patrons	Knowledge about the library patrons and their needs are essential for good service delivery
F: Skills and competencies of library personnel	Skills and competencies describes the qualities which the library personnel should possess	Skilled personnel contribute to the success of the library
G: On-going monitoring of challenges and trends	Libraries are faced with certain challenges as identified in the literature as well as trends that patrons expect library personnel to be aware of	Knowledge regarding important challenges and trends helps library personnel to stay informed of patrons expectations
H: Action research surveys	On-going research surveys describe the ways that are used to stay on top of patrons information needs and preferences	Continuous surveys are necessary to keep in touch with the needs of current and new patrons of the library

7.5 CONCLUSION

Information and data gathered in Chapters 2-4 and 6 were used as basis for the development of the model for an agricultural library. The components that are important in an ideal agricultural library are reflected in the model. It also emphasises the importance of continuous monitoring of all agricultural and library environments that contribute to a successful library.

The next chapter, Chapter 8, the study will be evaluated and concluding remarks will be made, based on the findings in the study. Recommendations for future use will be made.

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

8.1 INTRODUCTION

In the previous chapter, Chapter 7, the proposed service model for an agricultural library was discussed and visually portrayed. This chapter is aimed at summarising the research findings of the study, to provide recommendations for an agricultural library and to suggest directions for future research. These outcomes are based on the following research problem as formulated in Chapter 1 (section 1.7):

- What should a service model look like that can direct the changing roles of libraries and librarians to be successful and effective in rendering services to researchers and other patrons in an agricultural research environment, with specific reference to the ARC-SGI?

The research problem was investigated through the following research questions identified in Chapter 1 (section 1.7.1):

1. What have been reported with regard to the services offered by agricultural information services in the context of developed as well as developing countries?
2. What are the needs and information seeking behavioural patterns of the researchers and other patrons of the library?
3. What competencies and skills do librarians need to effectively execute their role in such a research environment?
4. What should a model for an agricultural library in contemporary South Africa be like to keep track of international trends, changing patron needs and information behaviour?
5. How can the changing role of librarians be incorporated in such a library?

The data collection methods that were used are as follows:

- A questionnaire;
- Interviews; and
- Literature reviews.

The research problem with the subsequent research questions were theoretically as well as empirically addressed in order to fulfil the objective of the study as stipulated in Chapter 1 (section 1.8), which includes the proposed service model for an agricultural library.

8.2 RESEARCH FINDINGS

The findings regarding the research problem as reflected in the research question will be summarised in the following few sections.

8.2.1 Findings of the research problem

The purpose of the study was to determine: '**What should a service model look like that can direct the changing roles of libraries and librarians to be successful and effective in rendering services to researchers and other patrons in an agricultural research environment, with specific reference to the ARC-SGI?'**

This question has been successfully addressed in this study. All the data which had been collected through the questionnaires, interviews and literature reviews were used to compile the proposed service model as depicted in Chapter 7 (section 7.3). This model contains all the elements which have been identified as important in the literature and the empirical investigation.

All the research questions as outlined in Chapter 1 (section 1.7.1) and again in this chapter (section 8.1) have been met as stipulated in section 8.2.2.

8.2.2 Findings based on the research sub-questions

The research sub-questions will be discussed and summarised individually to confirm that all the questions have been addressed in the results of the study.

8.2.2.1 Research question 1: What have been reported with regard to the services offered by agricultural information services in the context of developed as well as developing countries?

This question was discussed and answered in Chapter 2. The importance of library services have been emphasised and the services and sources available at ARC-SGI has been discussed in detail and compared to libraries worldwide. The services rendered at ARC-SGI compared favourably to other libraries around South Africa and the world. The literature revealed that there are many challenges facing agricultural libraries, which also have an effect on ARC-SGI.

The results of the empirical research were discussed in Chapter 6. The Research group indicated that most of the library services were 'very important', while the Support group did indicate that the lending of library material was 'very important', but for them the rest of the services were divided between 'very important', 'important' and 'not important'.

The study also found that the Research group regarded 'limited access to global information sources' as their main problem when searching for information, while the

results of the Support group did not indicate outstanding problems experienced. During the interviews the participants had the further opportunity to elaborate on their preferences for library sources and services. They expressed their satisfaction with the current services and sources, but still added some more as discussed in Chapter 6 (sections 6.3.3 to 6.3.6). Databases they would like to have access to are ScienceDirect and Wiley Blackwell.

One can conclude that library services and sources are considered as very important at ARC-SGI and that it should be reviewed on a regular basis to ensure that the patrons needs stay covered in the future.

8.2.2.2 Research question 2: What are the needs and information seeking behaviour patterns of the researchers and other patrons of the library?

This question has been answered through the literature review as reported in Chapter 3 as well as an empirical investigation, of which the results are discussed in Chapter 6. Outstanding points that were found during the literature review were the characteristics of patrons, models of information seeking behaviour, information sources chosen by researchers, the format in which they prefer their information and also the importance of library instruction and information literacy.

In the empirical investigation the information seeking behaviour patterns of the two groups at ARC-SGI, namely the Research group and the Support group, are discussed and analysed. ‘Research’ was mentioned as the main purpose for their need for information by the Research group. The Support group indicated both ‘solving work-related problems’ and ‘administrative purposes’ as the main reasons they need information. The Research group chose ‘Google’ as their preferred search engine with ‘SpringerLink’ as their first choice database. Furthermore the Research group indicated that they chose ‘journals’, ‘search engines’ as well as ‘books’ as their top three sources in various stages of their research. The Support group also chose ‘Google’ as their preferred search engine, but indicated that they do not use databases at all due to the nature of their work. The top three sources that they use in various stages of their work are ‘search engines’, ‘personal information sources’ and ‘books’. For study purposes, the Research group indicated that they regard ‘journals’ as their most important source, while the Support group included no current students (except for the researcher).

‘Both abstract and full text’ and ‘both print and electronic’ were regarded as important formats for information by the Research group. ‘Full text’ and ‘both print and electronic’ formats was indicated as important by the Support group. The training needs of patrons came out more strongly during the interviews than in the questionnaire. A number of the participants mentioned during the interviews that they need training in all sources and various services. With the questionnaires, training needs were identified with ‘ineffective search techniques’, ‘results not applicable to information needs’ (Table 6.17) and ‘training in the use of databases’ (Table 6.21).

Again the researcher can conclude that continuous evaluation of the needs and information seeking behaviour of the patrons is extremely important to stay in touch with their changing needs.

8.2.2.3 Research question 3: What competencies and skills do librarians need to effectively execute their role in such a research environment?

Research question 3 was answered only by doing a literature search; there was no empirical investigation involved. The literature search was discussed in Chapter 4. The skills and competencies that librarians need to fulfil their role in a research environment were divided into professional competencies and personal competencies.

The IT environment has brought a definite change in the skills that modern librarians need to be effective in their jobs. Traditionally, librarians executed functions like cataloguing and classification, interlibrary loans, collection development and indexing. In today's environment the traditional skills are still important, but IT introduced functions like online literature searches, the Internet, automated library systems and a modern approach to service delivery.

The focus has shifted to placing the customer in the centre of attention and information is supplied in the way that the patron needs it. It is no longer necessary for the patron to come to the library, due to new technology like online databases and journals, patrons can access the needed information from their desktops.

For the purpose of this study, it is important for library personnel to continuously refresh their skills to be able to deliver effective services to their patrons. Skills and competencies of librarians therefore play a definite role in the service model for an agricultural library.

8.2.2.4 Research question 4: What should a service model for an agricultural library in contemporary South Africa be like to keep track of international trends, changing patron needs and information behaviour?

A model for the planning as well as a model for rendering service is suggested for an agricultural library. This is discussed in Chapter 7. During the first phase a simplified version of the model has been established, based on the first three research questions of this study. The components of the research questions - which are the 'patrons', 'library services', 'information sources', 'information seeking behaviour' and the 'skills and competencies of library personnel' - have been discussed separately based on discussions in Chapters 2-4 and 6 to provide a clear understanding of the proposed service model. The components are explained in Chapter 7 (sections 7.2.1 to 7.2.5) and the basic model in Figure 7.1.

The second phase of the proposed new service model is based on addressing research questions 4 and 5, which are the 'on-going monitoring of challenges and trends' and the 'action research surveys among patrons'. The components of these research questions have been identified through the literature searches, the empirical investigation as well as the knowledge and experience of the researcher. The components are described in Chapter 7 (sections 7.3.1 and 7.3.2). The adapted basic model is displayed in Figure 7.9.

In the third phase the proposed service model for an agricultural library has been composed. All the components of the two previous phases were put together to complete the proposed service model, displayed in Figure 7.10. As a summary, the components of the new service model are presented in Table 7.1.

8.2.2.5 Research question 5: How can the changing role of librarians be incorporated in such a library?

The changing roles of the librarians are discussed in Chapters 4, 6 and 7. In Chapter 4 the skills and competencies needed by librarians to fulfil their traditional role as well as their role in the modern IT environment is outlined. The role of the librarian is also mentioned during the empirical investigation and addressed in Chapter 6 (section 6.3.19). It is expected from librarians, among other things, to be aware of new trends and projects in the organisation where they work, to be knowledgeable in new aspects in the library environment and to inform researchers of general information, such as funding opportunities that could be helpful to them.

In Chapter 7 these changing roles are incorporated in the proposed service model in sections 7.2.6 and 7.2.7. It will always be important for library personnel to commit to lifelong learning to stay informed of new developments if they are dedicated to effective service delivery.

8.3 LIMITATION OF THE STUDY

The question of information literacy, as discussed in Chapter 3 (section 3.3.5) was not specifically addressed in the empirical investigation. Training needs were addressed, which gave the researcher an indication that there may be a challenge regarding information literacy. The empirical investigation revealed that there is a need for training, among others, in the use of databases, search engines, personal information software, current awareness services, etc. Though it was not essential for this study, the inclusion thereof could have been to the advantage of the study. It is therefore added as one of the suggestions for further studies.

8.4 RECOMMENDATIONS FOR AN AGRICULTURAL LIBRARY WITH SPECIFIC REFERENCE TO ARC-SGI

Based on the literature studies as well as the empirical investigation, this study revealed a few aspects that can benefit the library services of ARC-SGI. The following recommendations are made:

8.4.1 Training of patrons

The patrons indicated that they have a need for training as portrayed in Chapter 6 (sections 6.2.17 and 6.3.10). Training needs include the following aspects:

- Use of databases;
- Use of search engines;
- Setting up profiles for alerting services;
- Executing literature searches;
- Use of reference management software; and
- Use of Personal Information Management.

Training is also regarded as an important function of the librarian and should be done continuously.

8.4.2 'Ask a librarian online' service

An 'ask a librarian online' service is a reference service available on the library's web page through which researchers and other patrons can ask the librarian any question they want. A service of this kind could be advertised on the library's website. It is similar to a feature that appeared on some of the other libraries' websites called a 'question and answering service' (Parihar & Pattnaik 2007, p. 41). It will give the patrons the opportunity to ask questions directly through the website, which can be in turn answered personally to the patron. Care should be taken that the library personnel respond very quickly as slow response can reflect poorly on the library.

8.4.3 Current Awareness Services

Apart from the regular Table of Contents that the library of ARC-SGI sends out, a formal Current Awareness Services could be a big advantage to the researchers as described in Chapter 2 (section 2.6.11). Formal profiles of a researcher's needs are composed using suitable software, which is run as regularly as the researcher chooses. The references are sent directly to his e-mail address. This service can spare the researchers valuable time and assist them in staying in touch with new developments in their respective fields of research.

8.4.4 Formal exchange agreements

As stated in Chapter 2 (section 2.6.11) the ARC-SGI library does not have formal exchange agreements of collection material with other organisations. Exchange agreements need not to be limited to library material such as annual reports, etc., but could include mutual training programmes of library personnel. Such agreements can hold benefits for all parties. Exchange programmes are quite common practice in libraries worldwide (Kgosiemang 1999; Zhang 1991).

8.4.5 Support with referencing techniques

As mentioned in Chapter 2 (section 2.6.11) and based on the researcher's own experience in the library, there exists a definite need for support with referencing techniques. Referencing techniques differs within educational institutions and remains a constant dilemma for the researchers. Guidelines on the library website as well as personal technical assistance can be useful.

8.5 SUGGESTIONS FOR FURTHER RESEARCH

During the progress of this study, some issues emerged that justify further research. They are discussed in the following sections. Practical as well as theoretical issues are addressed.

8.5.1 Open Access resources

Open Access and its benefits are discussed in Chapter 2 (section 2.6.4) with Haider 2007; Morrison (2006) and Yiotis (2005) elaborating on the benefits. In an agricultural environment there are a number of Open Access resources available that are either not fully used or entirely unknown. These sources can be of great benefit to the researchers as well as librarians. The researcher may benefit from publishing in Open Access journals by gaining additional international exposure. By finding and identifying national and international Open Access sources that are specifically aimed at agriculture, the libraries can upgrade their services to their patrons and expand on its available sources. The issues of Open Access sources, the benefits of Open Access and digital curation of information should be investigated further.

8.5.2 Information literacy

Information literacy has been discussed in Chapter 2 (section 2.6.8) and the researcher also mentioned it as a limitation of this study. Considering the increasing importance of information literacy in the workplace and digital literacies (Bawden & Robinson 2002; Bent, Gannon-Leary & Webb 2007) as well as an interest in advanced information literacy (Du Bruyn, Fourie & Bothma 2013), a workplace information literacy programme

can be developed focusing on research and support staff (Somerville, Howard & Mirijamdotter 2009).

8.5.3 Marketing of libraries

The marketing of libraries was briefly discussed in Chapter 2 (section 2.6.6) as well as in Chapter 6 (section 6.3.15). The literature emphasised the importance of marketing as confirmed by Rowe and Britz (2009) and Singh (2006). Although the current marketing strategy was received favourably by ARC-SGI, the researcher realises that this is a field of uncertainty and not fully explored in the ARC and therefore suggest further research in this regard.

8.5.4 Embedded librarianship

The issue of embedded librarianship was discussed in Chapter 2 (section 2.6.10) and is considered an important issue in an agricultural library. The embedded librarian works closely with researchers on specific projects and operates as part of the project team. This entails that the embedded librarian should have in-depth knowledge of the projects that are running at the specific organisation. In an agricultural research organisation the embedded librarian can deliver an important on-going service and it is worth further investigation.

8.5.5 Library services: the personal touch

In the digital age, where computers, the Internet and desktop access play such a vital role in the lives of patrons, it is important to remember that patrons still value the personal touch of library personnel. Personal knowledge of the patrons as well as of their research projects and information needs contributes to effective library services. The effect of a positive attitude of library personnel is demonstrated in the literature in a study done by Mi and Gilbert (2007, p. 45) and is also reflected in the empirical study as discussed in Chapter 6 (section 6.3.20). Kuhlthau also stressed the importance of feelings in her model of information seeking behaviour as discussed in Chapter 3 (section 3.3.2.4). The librarian frequently acts as mediator between the patron and the information sources and should be able to handle the patron with insight and competency. The 'personal touch' is regarded as a valuable asset of library services and should be investigated further. It would especially be useful to align this with affect and emotion stressed in the emerging affective paradigm towards information systems and information sources (Nahl & Bilal 2007).

8.5.6 Knowledge sharing

Personal communication between researchers is becoming more and more important between researchers. It is evident through the literature consulted that personal communication is commonly used among researchers (French 1990, p. 419; Kuruppu &

Gruber 2006, p. 613; Majid, Anwar & Eisenschitz 2000, p. 159; Niu et al. 2010, p. 874). The empirical investigation revealed that personal communication was rated under the top five important information resources used by both the Research group as well as the Support group. Today organisations and employees have to adapt to an environment that is constantly changing (Rodriguez-Elias et al, 2006, p. 210). They have to create a platform where the tacit as well as the explicit knowledge of the organisation can be shared and preserved. The sharing of knowledge includes both the personal communication as well as the written information that is available within an organisation. Knowledge portals (Van Baalen, Bloemhof-Ruwaard & Van Heck 2005) may be applied to facilitate knowledge sharing. This relevant topic is considered very important for a research organisation and should be investigated further.

8.6 CONCLUSION

This chapter was aimed at summarising the theoretical and empirical investigation and to confirm that the problem statement and research questions as stated in Chapter 1 (section 1.7) have been met. Furthermore, the limitation of the study was mentioned; recommendations for an agricultural library were made and the chapter was concluded by suggestions for future research.

A service model for an agricultural library was proposed displaying all the essential components necessary to deliver a successful information service to the patrons of ARC-SGI.

The researcher concludes that this study has successfully addressed all the research questions proposed in Chapter 1. This study confirmed that library services and sources play an important role in the agricultural researchers' lives. The study also pointed out that knowledge of the patrons' information needs and information seeking behaviour are essential factors contributing to effective service delivery.

Personally, the researcher gained valuable insight into the library needs of the patrons and hope to develop the library in such a way that it fulfils in the standards set by the patrons of the ARC-SGI library.

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APPENDIX A:

Questionnaire for a quantitative study on the information needs and information behaviour of library users at the ARC-Small Grain Institute including research personnel, research support staff (e.g. Research Assistants, Research Technicians) and administrative staff (e.g. from Finance, Facilities and Human Resources)

A. GENERAL

A.1 What is your position in the ARC-Small Grain Institute?

RESEARCH PERSONNEL

- ☐ Management
- ☐ Researcher
- ☐ Research Technician
- ☐ Research Assistant

SUPPORT PERSONNEL

- ☐ Finance
- ☐ Human Resources
- ☐ Secretary
- ☐ Public relations
- ☐ ICT
- ☐ Facilities
- ☐ Administration

B. INFORMATION NEEDS

B.1 For what purpose do you need information? (You may mark more than one option)

- ☐ Research
- ☐ Study
- ☐ Project proposal
- ☐ Solving work-related problems not requiring a research project
- ☐ Management purposes
- ☐ Administrative purposes
- ☐ **Other (please specify):**

……

……

B.2 What type of information do you require? (You may mark more than one option)

- ☐ Background information
- ☐ Research findings
- ☐ Reported research projects
- ☐ Research methods
- ☐ Research instruments
- ☐ Solutions to problems
- ☐ Correct citations
- ☐ Definitions and clarification of concepts
- ☐ **Other (please specify):**

……

B.3 On which broad categories of topics do you require information? (You may mark more than one option)

☐	Biological control	☐	Plant breeding
☐	Biological farming	☐	Plant pathology
☐	Biotechnology	☐	Plant physiology
☐	Crop protection	☐	Soil cultivation
☐	Ecology	☐	Soil fertility
☐	Entomology	☐	Statistics
☐	Financial management	☐	Strategic management
☐	Human resources	☐	Weed science

☐ **Other** (please specify any other topics not listed here. This is essential for the library to expand the scope of services and the collection of information sources)

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B.4 Which factors impact on your need for information?

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C. INFORMATION SOURCES

C.1. How often do you use the library to access needed information?

☐ Daily
☐ Weekly
☐ Monthly
☐ Seldom
☐ Never

C.2 Do you normally use the library helping yourself or do you ask the personnel for assistance?

☐ Help myself
☐ Ask for assistance
☐ Both
☐ Do not use the library

C.3 In what format do you prefer to view information? (You can mark more than one option)

☐ Abstracts
☐ Full text
☐ Both abstracts and full text
☐ Print
☐ Electronic
☐ Both print and electronic
☐ **Other** (please indicate if you have other preferences e.g. with regard to audio, suitability for visual disability)

……

……

……

……

C.4 Which databases do you normally use? (This may include databases available through the ARC-Libraries (Intranet), as well as through other institutions, which you might have access to, e.g. as an enrolled student)

Databases	Solely	Most of the time	To some extent	Not at all
Agricola				
CAB				
EBSCO				
ScienceDirect				
Scirus				
Scopus				
SpringerLink				
Other – please add:				

C.5 Which search engines do you use?

Search engines	Solely	Most of the time	To some extent	Not at all
Dogpile				
Google				
GoogleScholar				
KartOO				
Metacrawler				
MSN				
Yahoo				
Other – please add:				

For questions C.6 to C.8 it is assumed that there are different stages in a research project (e.g. determining the availability of information or suitable methods). Please read carefully.

C.6 Which sources do you use to determine the availability of information on the research problem?

Information sources	Solely	Most of the time	To some extent	Not at all
Annual reports				
Books				
Databases				
Dissertations / Theses				
Electronic discussion lists				
Journals				
Library catalogue(s)				
Personal information sources e.g. conversations with colleagues and other experts				
Research reports (internal as well as external)				
Search engines				
Table of contents (TOC) alerts				
Workshops, seminars and conference proceedings				
Other – please add:				

C.7 Which sources do you use to determine the <u>methodology or techniques</u> to solve the research problem?

Information sources	Solely	Most of the time	To some extent	Not at all
Annual reports				
Books				
Databases				
Dissertations / Theses				
Electronic discussion lists				
Journals				
Library catalogue(s)				
Personal information sources e.g. conversations with colleagues and other experts				
Research reports (internal as well as external)				
Search engines				
Table of contents (TOC) alerts				
Workshops, seminars and conference proceedings				
Other – please add:				

C.8 Which sources do you use to keep <u>up-to-date with new information</u> in your area of interest?

Information sources	Solely	Most of the time	To some extent	Not at all
Annual reports				
Books				
Databases (e.g. saved search profiles)				
Dissertations / Theses				
Electronic discussion lists				
Journals				
Library catalogue(s)				
Personal information sources e.g. conversations with colleagues and other experts				
Research reports (Internal as well as external)				
Search engines				
Table of Contents (TOC) alerts				
Workshop, seminar and conference proceedings				
Other – please add:				

C.9 Which problems do you experience when searching for information?

- ☐ No Internet connection
- ☐ Slow Internet bandwidth
- ☐ Articles in foreign languages
- ☐ Ineffective search techniques
- ☐ Not aware of relevant sources to search for information
- ☐ Limited access to global information databases
- ☐ Results not applicable to your information needs
- ☐ **Other reasons (please specify):**

……

……

……

……

……

……

C.10. Answer this question only if you are <u>enrolled for undergraduate or postgraduate studies</u>. Which information sources do you use for study purposes?

Information sources	Solely	Most of the time	To some extent	Not at all
Annual reports				
Databases (e.g. saved search profiles)				
Dissertations / Theses				
Electronic discussion lists				
Journals				
Library catalogue(s)				
Personal information sources e.g. conversations with colleagues and other experts				
Research reports (internal as well as external)				
Search engines				
Table of Contents (TOC) alerts				
Textbooks				
Workshop, seminar and conference proceedings				
Other – please add:				

D. LIBRARY SERVICES

D.1 How important is the following services currently offered by the library to you?

	Very important	Important	Not important	Not aware of
Lending of books, journals, etc.				
Interlibrary loans				
Library services & sources training				
Literature searches				
Reference & enquiries services				
Table of contents (TOC) service				

D.2 What other type of services/sources do you require from the library?

- ☐ Access to databases available for free
- ☐ Alerting services (e.g. create profiles and registering for TOC services)
- ☐ Bibliographies
- ☐ Links to search engines
- ☐ Reference management software
- ☐ Training in the use of databases
- ☐ Subscription to relevant databases other than CAB and SpringerLink:

……

D.3 Which services in addition to the above would you like the library to offer?

……

……

……

……

D.4 Satisfaction with services offered by the library. Please indicate your satisfaction on the scale below. "10" Would represent "Excellent service" and "1" "Extremely unsatisfactory" service.

10	9	8	7	6	5	4	3	2	1

E. ADDITIONAL INFORMATION

E.1 Any other comments or recommendations you would like to add:

……

……

……

……

……

THANK YOU FOR YOUR TIME AND EFFORT

APPENDIX B:

Interview schedule for the qualitative study to investigate the adequacy of the services and information sources offered by the library of the ARC-Small Grain Institute.

This interview questionnaire is supplementary to the first questionnaire to offer the opportunity to participants to expand freely on the listed questions.

A. GENERAL

(Questions in this section are included to get a profile of interview participants in terms of their section, position, frequency of library use and reasons for using the library or not.)

A.1 What is your position in the ARC-Small Grain Institute?

RESEARCH PERSONNEL

☐ Management

☐ Researcher

☐ Research Technician

☐ Research Assistant

SUPPORT PERSONNEL

☐ Finance

☐ Human Resources

☐ Secretary

☐ Public Relations

☐ ICT

☐ Facilities

A.2. How often do you use the library to access needed information?

☐ Daily

☐ Weekly

☐ Monthly

☐ Seldom

☐ Never

A.3 Why do you use the library? / Why are you not using the library?

B. LIBRARY SERVICES AND INFORMATION SOURCES

Awareness of library services and preference for services and information sources:

B.1 Which of the services the library offer is most important to you? The library currently offers:

Circulation of library material
Document delivery
Interlibrary loans
Literature searches
Table of contents (TOC) alerting service.

B.2 Are there other services you would prefer the library to offer?

B.3 Are there other information sources you would prefer the library to offer? The library service currently offers:

ARC libraries web page on the intranet
CAB Abstracts
Ebsco
SpringerLink

B.4 Which sources other than the library do you use to obtain information and why?

B.5 How do you use the information obtained through the library services?

B.6 Which factors impact on your use of the library and information sources?

B.7 What is your opinion on the involvement of the librarian?

B.8 Can you please elaborate on your training needs in terms of the following services?

Training in the use of databases, e.g. CAB, SpringerLInk, etc.
Help with setting up a profile for alerting services
Training in executing literature searches
Training in the use of reference management software
Training in the use of search engines
Training in the use of Personal Information Management (PIM)

C. LIBRARY COLLECTION

C.1 Does the library collection meet with your information needs? Please explain where the library can expand on its collection

Annual reports
Books
CD's & cassettes
Farmer's day booklets
Journals
Maps
Production guidelines
Progress reports
Slides
Technology reports
Travel reports
What other types of material would you recommend to the library?

C.2 Do the topics covered by the library meet with your expectations and on which topics should the library expand?

Currently the library covers Biological control, Biological farming, Biotechnology, Crop protection, Ecology, Entomology, Financial management, Human resources, Plant breeding, Plant pathology, Plant physiology, Soil cultivation, Soil fertility, Statistics, Strategic management, Weed Science.

C.3 Do the physical facilities in the library meet with your information needs? Please express your opinion on the following:

Size of the library's information sources
Shelves
Display areas
Reading areas
Lighting
Power sockets for laptops

C.4 What other physical facilities would you like to see in the library?

D. MARKETING OF THE LIBRARY

D.1 What is your opinion about the library's efforts in promoting the library services (e.g. the use of e-mail notifications, scientific seminars, displays in the library)?

D.2 Which other methods of promotion would you suggest?

D.3 Which methods of promotion would you prefer?

E. TRENDS

E.1 Which trends in the agricultural environment should the library note in order to improve its services and collection?

E.2 Which trends in the South African and international society should the library note in order to improve its services and collection?

THANK YOU

APPENDIX C:

INFORMED CONSENT FORM:

Form for research subject's permission

1 Title of research project: Service model for libraries in an agricultural environment with specific reference to the library of the ARC-Small Grain Institute.

2 I, ……, hereby voluntarily grant my permission for participation in the project as explained to me by Mrs. Juliette Kilian (Library: ARC-Small Grain Institute). Participation will include an individual interview or completion of a questionnaire. I agree to interviews being tape-recorded.

3 The nature, objective and implications have been explained to me and I understand them.

I understand that the project is aimed to acquire insight to the information behaviour and -needs of the researchers of ARC-Small Grain Institute.

4 I understand my right to choose whether to participate in the project and that the information furnished will be handled confidentially. I am aware that the results of the investigation may be used for the purposes of publication.

5 Upon signature of this form, you will be provided with a copy.

Signed: _____ Date: _____

Witness: _____ Date: _____

Researcher: _____ Date: _____

APPENDIX D:

RESEARCHER DECLARATION:

Hereby I, Juliette Kilian, in my capacity as researcher, declare that:

1 Research subjects will be informed, information will be handled confidentially, research subjects reserve the right to choose whether to participate and, where applicable, written permission will be obtained for the execution of the project (example of permission attached). Permission to conduct the survey will also be obtained from the ARC-Small Grain Institute.

2 No conflict of interests or financial benefit, whether for the researcher, company or organisation, that could materially affect the outcome of the investigation or jeopardise the name of the university is foreseen.

3 Inspection of the experiments in loco may take place at any time by the committee or its proxy.

4 The information I furnish in the application is correct to the best of my knowledge and that I will abide by the stipulations of the committee as contained in the regulations.

5 Signed:  Date: 10 August 2010

APPENDIX E:

University of Pretoria

Reference number: EBIT/31/2010 27 August 2010

Ms J Kilian
46 Loubser Street
Bethlehem
9700

Dear Ms Kilian

YOUR RECENT APPLICATION TO THE FACULTY COMMITTEE FOR RESEARCH ETHICS AND INTEGRITY

1. I hereby wish to inform you that the research project titled "Service model for libraries in an agricultural environment with specific reference to the library of the ARC-Small Grain Institute" has been approved by the Committee.

   This approval does not imply that the researcher, student or lecturer is relieved of any accountability in terms of the Codes of Research Ethics of the University of Pretoria, if action is taken beyond the approved proposal.

2. According to the regulations, any relevant problem arising from the study or research methodology as well as any amendments or changes, must be brought to the attention of any member of the Faculty Committee who will deal with the matter.

3. The Committee must be notified on completion of the project.

The Committee wishes you every success with the research project.

Prof. J.J. Hanekom
Chairman: Faculty Committee for Research Ethics and Integrity
FACULTY OF ENGINEERING, THE BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

APPENDIX F:

For approval of:
Mr M Netsianda: ED: HC&SS

Prepared by:
J Kilian,
ARC-SGI

2 September 2010

REQUESTING PERMISSION FOR MS J KILIAN (M.IS, INFORMATION SCIENCE STUDENT) TO CONDUCT QUESTIONNAIRES AND INTERVIEWS USING ARC-SGI EMPLOYEES FOR THE PURPOSE OF COMPLETING HER ACADEMIC STUDIES

1. Purpose of the report

To obtain approval for Ms J Kilian (M.IS Information Science student) to conduct questionnaires and interviews using ARC-Small Grain Institute (ARC-SGI) personnel for the purpose of completing her academic studies.

2. Background to the report

Name of student	Juliette Kilian
Degree	M.IS (Information Science)
Title of research project	Service model for libraries in an agricultural environment with specific reference to the library of the ARC-Small Grain Institute
Department	Information Technology
Academic Institution	University of Pretoria, Pretoria
Area/topic of research	Library services; information needs and behaviour
Sample size (questionnaires) **Sample size (Interviews)**	54 15
Categories of employees	Researchers, Technicians, Research assistants & Support staff
Starting date:	Upon approval

In a research organisation like the ARC-Small Grain Institute, the library exists as support to the researchers and the research that is being done, as well as to serve the information needs of research and administrative supportive staff such as staff from Finance, Facilities, ICT and Human Resources. Access to information ensures that users stay on top of their projects and well informed.

As library and information services consider the user as equally important to the collections that they keep, it is necessary to know their information needs and their information seeking

behaviour. In addition to this, the specific services that the library of ARC-Small Grain Institute has to offer therefore need to be investigated as well. It is important that the services match the needs of the users in order to render an efficient service.

3. Experimental methods

A questionnaire (attached) will be e-mailed to all the users of the ARC-Small Grain Institute's library. (The users include researchers, research support staff such as research assistants and technicians, and academic support staff e.g. from Finance, Facilities and Human Resources). The library users are estimated at 54. Participants will be requested to complete the questionnaires in their own time and send it back to the respondent. Interviews, to investigate the adequacy of the services offered by the library and suggestions for additional services will be held with 15 users. Interviews will be concentrated on the researchers and research staff members as they are the library's main clients.

4. Conclusion

This study is in support of the users of ARC-SGI and therefore it is in no way detrimental to the ARC as an organisation. All the information will be regarded as confidential and the participants name will be publicized. Their names are also not required on the questionnaires and participation takes place on their own free will.

5. Strategic implications

By granting permission to Ms Kilian to commence with the project, the ARC will contribute to the library rendering more effective services. This will enhance the vision of the ARC to be an organisation of research excellence.

6. Resource implications

None.

7. Recommendations

It is recommended that approval is granted to Ms J Kilian to conduct questionnaires and interviews using ARC-SGI employees.

LIBRARIAN / RESEARCHER:

Signed: …… Date: 3 September 2010

MS J KILIAN

GENERAL MANAGER: ARC CROPS DIVISION:

Comments:

Recommended

Signed ..... Date 2010.9.3

DR J LE ROUX

EXECUTIVE DIRECTOR: HC&SS:

Comments: Approved. Ms Molope to oversee the whole process.

Signed: ..... Date: 25/10/10

MR M NETSIANDA

Documents attached

- Letter from the University of Pretoria
- Application to the Research and Ethics Committees of UP
- Approval from the Ethics Committee of UP
- Questionnaire and Interview questionnaire