Information as a Service for Dairy Farmers

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Information as a Service for Dairy Farmers

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DECLARATION:

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned treatise is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

SIGNATURE: __________________________________________

DATE: 30 January 2017
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ABSTRACT

Communication with an organisation’s customers has become one of the most important factors that play a role in doing business today. Organisations that supply their customers with correct and different kinds of information create customer loyalty. Dairy farmers are no exception to the rule, because of the ongoing planning that dairy farmers need to do on a daily basis. Dairy farming in South Africa is extremely price sensitive and therefore information that can help in decision making plays an important role in making the right decision at the right time.

The Internet has become an essential environment where information is readily available to anyone who has access to the technologies, such as smartphones, computers and tablets. Thus, it will be beneficial for both the organisation and the dairy farmer to have relevant information available on the organisation’s website. The information that is made available to the dairy farmers on these websites needs to be updated on a daily basis. The information must be relevant to dairy farming and must provide additional information besides the information that the specific organisation specialises in.

Information as a Service (IaaS) for Dairy Farmers in South Africa is the focus of this research. The purpose of the investigation is to provide a means of providing the information needed by dairy farmers in South Africa, to enable them to make the right decisions on an operational level. The empirical data were collected, analysed and interpreted. From these findings a proposed communications framework is created to assist organisations to better communicate with dairy farmers in South Africa.

The purpose of this research study is to design a framework which will provide IaaS to dairy farmers in South Africa. The research determined the different ways in which organisations can communicate with dairy farmers and the best time period in which that communication should take place for each specific communication strategy. Therefore, the aim of the research study was to determine the best ways to communicate with dairy farmers. A clear knowledge of the technologies that dairy farmers use to manage information was determined by the research study. The required information that dairy farmers need to make the correct decisions suitable for the requirement of farming on a practical level was determined by the research study.
The proposed framework on Information as a Service for Dairy Farmers could help organisations to supply dairy farmers with the right information at the right time. The proposed framework will assist organisations dealing with dairy farmers easier and will also assist farmers, because the information provided as a service will be relevant to dairy farming.

The treatise is an exploratory, mixed method research study which consists of literature reviews, surveys and cross-sectional studies. Secondary resources was used to conduct literature studies to determine the information needed by dairy farmers. A questionnaire was compiled from existing questionnaires as well as from literature studies and was completed by the respective respondents in the dairy farming community. The survey also consists of questions that determine what dairy farmers think about the service they receive from the organisations that they deal with. A cross-sectional study was used to compare the information needed specifically by pasture-based dairy farmers in relation to total mixed-ration-based dairy farmers. Both Descriptive and Inferential Statistical methods will be used for the analysis of the data.

The communication systems can vary from Self-Help Groups to Mobile Technology. The type of communication system will depend on the systems that the organisation have available for their customers. The timing of communication with dairy farmers needs to be convenient and depends, according to literature, on the type of social networking that the organisation might use. An organisation that deals with dairy farmers needs to decide which Social Media site is most suitable when it needs to communicate with dairy farmers. The technology used to access information consist of Laptops, Smart Phones, Tablets and Desktops. Agricultural organisations provide information which dairy farmers need, to give them the correct guidance in performing good farming practices in order to produce safe, high-quality milk.

The study will conclude with the development of a proposed communications framework where agricultural organisations can provide information as a service to dairy farmers.

Keywords: Information as a Service, Dairy Farmers, Communication, Organisations, Dairy Farming Practices
TABLE OF CONTENTS

DECLARATION BY CANDIDATE ................................................................. i
ACKNOWLEDGEMENTS ........................................................................... ii
ABSTRACT ................................................................................................ iv
LIST OF FIGURES .................................................................................... x
LIST OF TABLES ......................................................................................... xiii
LIST OF ACRONYMS AND ABBREVIATIONS ............................................. xiv

Chapter 1  INTRODUCTION AND PROBLEM STATEMENT .................... 1

1.1  Background ....................................................................................... 1
1.2  Problem Statement .......................................................................... 3
1.3  Treatise Statement ........................................................................... 4
1.4  Research Objectives ......................................................................... 4
1.5  Research Questions .......................................................................... 5
1.6  Research Delimitation ....................................................................... 7
1.7  Significance of the Research ............................................................. 7
1.8  Research Methodology and Design ................................................... 7
   1.8.1 Research Approach ................................................................... 7
   1.8.2 Literature Review ....................................................................... 8
   1.8.3 Surveys ....................................................................................... 9
1.9  Data Analysis ................................................................................... 10
1.10 Ethics Clearance ............................................................................... 10
1.11 Overview of Chapters and Structure of the Treatise ......................... 10
1.12 Summary ......................................................................................... 13

Chapter 2  COMMUNICATION STRATEGIES FOR DAIRY FARMERS .......... 14

2.1  Introduction ..................................................................................... 14
2.2  Communication Systems .................................................................. 16
4.4.1 Positivism................................................................. 51
4.4.2 Interpretivism............................................................ 51
4.4.3 Realism........................................................................ 52
4.5 Research Approaches .................................................... 52
4.6 Research Strategies ....................................................... 54
4.6.1 Information as a Service for Dairy Farmers Survey ............ 54
4.6.2 Strengths and Weaknesses of the Data Collection Methods Used .... 59
4.7 Statistical Methods.......................................................... 60
4.8 Reliability and Validity ...................................................... 62
4.8.1 Reliability.................................................................... 63
4.8.2 Validity........................................................................ 66
4.9 Research Paradigms .......................................................... 69
4.9.1 Quantitative Research ..................................................... 70
4.9.2 Qualitative Research....................................................... 70
4.9.3 Mixed Methods............................................................. 71
4.9.4 Research Paradigm for this Study ...................................... 71
4.10 Cross-Sectional Studies ................................................... 71
4.10.1 Cross-Sectional Studies Defined ....................................... 71
4.10.2 Purpose of Cross-Sectional Studies .................................... 72
4.10.3 Cross-Sectional Studies for this Study ................................. 72
4.11 Summary......................................................................... 72

Chapter 5 PROPOSED COMMUNICATION FRAMEWORK FOR DAIRY FARMERS
.................................................................................................. 74
5.1 Introduction..................................................................... 74
5.2 Analysis of Empirical Results ............................................. 76
5.2.1 IaaSDFS Response Rate................................................ 76
LIST OF FIGURES

Figure 1-1 Structural Overview of Chapter 1 ................................................................. 3
Figure 1-2 Chapter 1 Research Questions and Research Objectives ......................... 12
Figure 2-1 Chapter 2 Research Questions and Research Objectives ............................ 15
Figure 2-2 Structural Overview of Chapter 2 ................................................................. 16
Figure 2-3 Best and Worst Time Frames for Social Media .............................................. 25
Figure 3-1 Chapter 3 Research Questions and Research Objectives ............................ 33
Figure 3-2 Structural Overview of Chapter 3 ................................................................. 34
Figure 3-3 Most Important Devices to Access the Internet in the UK .............................. 35
Figure 3-4 Most Important Devices to Access the Internet in South Africa .................... 36
Figure 4-1 Chapter 4 Research Questions and Research Objectives ............................ 47
Figure 4-2 Structural Overview of Chapter 4 ................................................................. 48
Figure 4-3 The Research Onion ..................................................................................... 50
Figure 4-4 Inductive vs. Deductive Reasoning ............................................................... 53
Figure 4-5 Reliability and Validity of Data .................................................................... 63
Figure 5-1 Chapter 5 Research Questions and Research Objectives ............................ 75
Figure 5-2 Structural Overview of Chapter 5 ................................................................. 76
Figure 5-3 Online vs Manual ......................................................................................... 77
Figure 5-4 Age ................................................................................................................ 79
Figure 5-5 Gender .......................................................................................................... 80
Figure 5-6 Language ...................................................................................................... 81
Figure 5-7 Provinces ....................................................................................................... 82
Figure 5-8 Breeds of Dairy Cattle .................................................................................. 85
Figure 5-9 Types of Farming Systems ............................................................................ 86
Figure 5-10 Ways of Feeding Concentrates ................................................................. 87
Figure 5-11 Planted Crops ............................................................................................. 88
Figure 5-12 Crops Planted for Silage ............................................................................. 89
Figure 5-13 Dairy Parlours used by Dairy Farmers ......................................................... 90
Figure 5-14 Size of Dairy Herd ...................................................................................... 91
Figure 5-15 Method of Milking Dairy Cows ................................................................. 92
Figure 5-16 Technology used by Dairy Farmers ............................................................. 92
Figure 5-17 Importance of Weather Forecast ............................................................... 95
Figure 5-18 Importance of Planting Date for Maize as Silage ....................................... 96
Figure 5-19 Importance of Seed Cultivars ................................................................. 97
Figure 5-20 Importance of Planting Dates for Certain Pastures ...................... 98
Figure 5-21 Importance of the Correct Utilisation and Management of Pastures 99
Figure 5-22 Importance of Information on Total Mixed Ration Systems (TMR) 100
Figure 5-23 Importance of Information on Herd Health ................................. 101
Figure 5-24 Importance of Information on the Correct Feeding for Calves ...... 102
Figure 5-25 Importance of Guidelines on Feeding the Dairy Cow .................... 103
Figure 5-26 Importance of Guidelines on Feeding the Dry Cow ........................ 104
Figure 5-27 Importance of Information on Important Dates in the District ....... 105
Figure 5-28 Agricultural Organisations: Accurate Market Information .......... 107
Figure 5-29 Agricultural Organisations: Personalised Information .............. 108
Figure 5-30 Agricultural Organisations: Neatly Presented Information ........ 109
Figure 5-31 Agricultural Organisations: Needs .................................................. 110
Figure 5-32 Agricultural Organisations: Trustworthy Information ............... 111
Figure 5-33 De Heus: Accurate Market Information ........................................... 113
Figure 5-34 De Heus: Personalised Information ................................................. 114
Figure 5-35 De Heus: Information Neatly Presented ....................................... 114
Figure 5-36 De Heus: Needs ........................................................................... 115
Figure 5-37 De Heus: Trustworthy Information ............................................... 116
Figure 5-38 Usage of the Internet .................................................................... 117
Figure 5-39 Devices used to Access the Internet ........................................... 118
Figure 5-40 Usage of Internet Connections .................................................... 119
Figure 5-41 Days per Week the Internet is Accessed ....................................... 120
Figure 5-42 Hours per day spent on the Internet ............................................ 121
Figure 5-43 Purpose of Internet Usage ............................................................. 122
Figure 5-44 Conduct Business without the Internet ....................................... 123
Figure 5-45 Service Providers ....................................................................... 125
Figure 5-46 Usage of Mobile Phone for Internet .......................................... 126
Figure 5-47 Usage of Mobile Phone ................................................................. 127
Figure 5-48 Mobile Phone Types ...................................................................... 128
Figure 5-49 Conduct your Business without your Mobile Phone .................... 129
Figure 5-50 Respondents using a Tablet ........................................................... 129
Figure 5-51 Operating Systems for a Tablet .................................................... 130
Figure 5-52 Different Usages for the Tablet ..................................................... 131
Figure 5-53 Conduct your Business without a Tablet ................................................. 132
Figure 5-54 Type of Apps on Mobile Devices .............................................................. 134
Figure 5-55 Number of Free Apps ............................................................................. 135
Figure 5-56 Apps used in a Typical Day ..................................................................... 136
Figure 5-57 Different Market Information Researched ............................................. 138
Figure 5-58 Most Useful Sources of Information ....................................................... 139
Figure 5-59 Types of Market Indicators Researched .................................................. 140
Figure 5-60 Importance of Analyses ......................................................................... 141
Figure 6-1 Chapter 6 RQs and ROs ......................................................................... 145
Figure 6-2 Structural Overview of Chapter 6 ............................................................ 146
Figure 6-3 Communication Framework for Dairy Farmers ....................................... 153
LIST OF TABLES

Table 1-1 Research Questions, Research Objectives and Chapter Outline ............. 6
Table 2-1 Best and Worst Time Frames for Social Media ........................................ 22
Table 4-1 Practical Significance Interpretation Intervals ......................................... 62
Table 4-2 Types of Reliability .................................................................................. 66
Table 4-3 Types of Validity ..................................................................................... 69
<table>
<thead>
<tr>
<th>Acronyms &amp; Abbreviations</th>
<th>Terms in full</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>Asymmetric Digital Subscriber Line</td>
</tr>
<tr>
<td>Apps</td>
<td>Applications</td>
</tr>
<tr>
<td>BBM</td>
<td>Black Berry Messenger</td>
</tr>
<tr>
<td>BBP</td>
<td>Best Business Practice</td>
</tr>
<tr>
<td>CEO</td>
<td>Chief Executive Officer</td>
</tr>
<tr>
<td>CES</td>
<td>Commercial Extension Services</td>
</tr>
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<td>FNB</td>
<td>First National Bank</td>
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<tr>
<td>IaaS</td>
<td>Information as a Service</td>
</tr>
<tr>
<td>IaaSDFS</td>
<td>Information as a Service for Dairy Farmers Survey</td>
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<tr>
<td>IAB</td>
<td>Interactive Advertising Bureau</td>
</tr>
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<td>ICT</td>
<td>Information and Communications Technology</td>
</tr>
<tr>
<td>IDFP</td>
<td>Improved Dairy Farming Practices</td>
</tr>
<tr>
<td>IMDUS</td>
<td>Internet and Mobile Device Usage Survey</td>
</tr>
<tr>
<td>IM</td>
<td>Instant Message</td>
</tr>
<tr>
<td>ISF</td>
<td>Information Services Framework</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>KZN</td>
<td>KwaZulu-Natal</td>
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<tr>
<td>MMS</td>
<td>Multi-media Message Service</td>
</tr>
<tr>
<td>MPO</td>
<td>Milk Producers Organisation</td>
</tr>
<tr>
<td>NMMU</td>
<td>Nelson Mandela Metropolitan University</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>PCs</td>
<td>Personal Computers</td>
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<td>PDAs</td>
<td>Personal Digital Assistances</td>
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<tr>
<td>PMR</td>
<td>Partial Mixed Ration</td>
</tr>
<tr>
<td>RO</td>
<td>Research Objective</td>
</tr>
<tr>
<td>RoR</td>
<td>Ruby on Rails</td>
</tr>
<tr>
<td>ROs</td>
<td>Research Objectives</td>
</tr>
<tr>
<td>RQ</td>
<td>Research Question</td>
</tr>
<tr>
<td>RQM</td>
<td>Main Research Question</td>
</tr>
<tr>
<td>RQs</td>
<td>Research Questions</td>
</tr>
<tr>
<td>SG</td>
<td>Study Group</td>
</tr>
<tr>
<td>SGSY</td>
<td>Swarnjayanti Gram Swarozgar Yojana</td>
</tr>
<tr>
<td>SHG</td>
<td>Self Help Group</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Message Service</td>
</tr>
<tr>
<td>TMR</td>
<td>Total Mixed Ration</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>VoIP</td>
<td>Voice over Internet Protocol</td>
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</tbody>
</table>
1.1 Background

Agricultural produce is perishable, seasonal and generally bulky, therefore, it is important to receive appropriate information at the right time for markets to function effectively. A farmer is always in need of information, whether it is in the starting phase of planning to produce a crop or in the phase where he wants to market his produce. Farmers, in general, have little know-how about market conditions and this is why in most developing countries, the situation prevailing is that of asymmetric information (Svensson & Yangizawa, 2009). The farmer with a small amount of sales volume is in a disadvantaged position. A major factor influencing smallholder agriculture globally has been access to market information (Barrett & Davidson, 2008), hence it is important to know the reach and influence of market information services to farmers (Sakabira; Bonabana & Narathius, 2012).

In the era that we live in, there is a number of different avenues that farmers can utilise to find accurate and reliable market information by using Information and Communications Technology (ICT). In developing countries it is, however, more difficult to access information, because of the lack in infrastructure and limited investment capital (Barrett & Swallow, 2006). The markets need to be equipped with adequate infrastructure facilities so that up-to-date price information can be made available to the farmers who require it. In developing countries, access to the market helps alleviate poverty by commercializing agriculture and this results in a more uniform distribution of income. Information asymmetry is an important contributor to overall transaction costs (Barrett & Davidson, 2008).

Information costs have been drastically reduced by the advent of ICT in agriculture which made information easily accessible. ICT is any device, tool, or application that permits the exchange or collection of data through interaction or transmission (Lusch & Vargo, 2014, Tilson; Lyttinen & Sorensen, 2010). The following costs have been reduced through the use of ICT in agricultural marketing, namely, transaction costs, information search costs, travel costs and a reduction in wastage or spoilage (Lusch & Vargo, 2014). With the help of an ICT programme farmers can make informed
decisions, negotiate with the traders, determine in which market to sell, to store surplus, and to plan for future crops (Mwakaja, 2010; Jairath & Yadav, 2012). Rural homesteads also have come to rely on agriculture, because of the affordability, accessibility and adaptability of ICT. Illiterate poor farmers can now share in information by using technology such as voice messages. Ignoring the global ICT revolution in all spheres of life, will only lead to further excluding our poor farmers from mainstream development. The ICT sector has emerged as a powerful tool in agriculture and this has been witnessed in India. Since the 1980’s there has been a rapid growth in the ICT sector and its use rose dramatically since the 1990’s (Jain; Ahuja & Kumar, 2012), with a resultant, increasing improvement in farming methods and production.

Contrary to the view regarding all the positive elements that ICT brings about that distinguish innovation in services industries from service innovation or innovation generally, other theorists have posited that all economic exchanges are essentially service exchanges, and that ICTs have a fundamental and transformative role as resources in service innovation (Lusch & Vargo, 2014; Vargo & Lusch, 2004; Vargo & Lusch, 2008a; Vargo & Lusch, 2008b). From this perspective, ICTs combine with other resources (such as skills and knowledge) to allow information to be transported and repackaged in different contexts to create new opportunities for service exchange and for innovation (Lusch & Vargo, 2014). Similarly, recent work on digital infra-structure (Tilson, et al., 2010) has highlighted the generative nature of digital technologies (Henfridsson & Bygstad, 2013), which may facilitate a combinatorial potential for service innovation (Yoo; Boland Jr.; Lyttinen & Majchrzah, 2012). Along with other theoretical perspectives which will be considered shortly, these views suggest new ways of understanding service and new knowledge is sought to develop service innovation in the digital age. The researcher will use De Heus as a company in order to understand the ways in which a company must communicate with its customers and what requirements its customers have.

De Heus (Pty) Ltd. is a family-owned business, managed on a corporate system. The company belongs to the De Heus brothers located in Holland and has been manufacturing animal feed since 1911. The head office of De Heus South Africa is situated in KwaZulu-Natal (KZN). The company has operated since 2008 in KZN in South Africa. The first factory in South Africa was purchased at Umlaas Road near
Pietermaritzburg. Since 2008 three other factories have been purchased, namely in the Northwest-, Limpopo- and in the Western Cape regions. The company deals with customers, who purchase animal feed from them. These customers are farmers that can farm with any type of livestock on their farms.

The next section of this chapter will formulate and expand on the problem statement. The section will be followed by the Research Objectives, Questions and Delimitation. Key concepts will be defined. The significance and contribution of this research will be discussed followed by an explanation of the research methodology, design and ethics. The chapter concludes with an overview of the structure of this treatise. A structural overview of this chapter is presented in Figure 1-1.

### Chapter 1: Introduction and Problem Statement

1.1 Background  
1.2 Problem Statement  
1.3 Treatise Statement  
1.4 Research Objectives  
1.5 Research Questions  
1.6 Research Delimitation  
1.7 Significance of the Research  
1.8 Research Methodology and Design  
1.9 Data Analysis  
1.10 Ethics Clearance  
1.11 Overview of Chapters and Structure of the Treatise  
1.12 Summary  

#### Chapter 2: Communication Strategies for Dairy Farmers

#### Chapter 3: Technology Used by Dairy Farmers

#### Chapter 4: Research Design and Methodology

#### Chapter 5: Proposed Communication Framework for Dairy Farmers

#### Chapter 6: Recommendations and Conclusion

**Figure 1-1 Structural Overview of Chapter 1**

### 1.2 Problem Statement

**Problem Statement:** Dairy Farmers find it difficult to access and obtain the information they require in a timeous, relevant and personalised manner to make the necessary farming-related decisions.
De Heus requires a system where it can communicate certain information to its dairy farmers. The information that De Heus provides will help its dairy farmers in the decision-making process on their farms. The treatise will focus on the dairy farmers in particular in order to establish what information they require.

1.3 Treatise Statement

The treatise statement that will be addressed is:

A proposed Information Services Framework can improve communication services and the quality of Extension Services to dairy farmers and provide improved customer service.

1.4 Research Objectives

The Main Research Objective of this study is as follows:

**RO**: Identify the information requirements of dairy farmers for farming-related decision making.

In order to achieve the above stated main research objective the following secondary objectives need to be achieved:

- **RO1**: Identify the different communication strategies available to dairy farmers.
- **RO2**: Determine the appropriate time frames in which to communicate with dairy farmers.
- **RO3**: Identify Best Business Practice for communication with dairy farmers.
- **RO4**: Identify the technologies used by dairy farmers.
- **RO5**: Identify the information required by dairy farmers.
- **RO6**: Establish a research methodology that will provide clarity on what information service dairy farmers require.
- **RO7**: Propose a communications framework, using Information as a Service, for dairy farmers.
1.5 Research Questions

The Main Research Question (RQ_m) was formulated based on the Main Research Objective and is stated as follows:

**RQ_M** - What information is required by dairy farmers to be included as information as a service?

In order to analyse the above main research problem effectively, the following research questions, based on the secondary research objectives, need to be answered:

**RQ_1** - What are the different communication strategies by which organisations communicate with dairy farmers?

**RQ_2** - What time frame would be most suitable when communicating with dairy farmers?

**RQ_3** - How can an organisation best communicate with dairy farmers?

**RQ_4** - What technologies are dairy farmers using to access information at present?

**RQ_5** - What information do dairy farmers require?

**RQ_6** - What research methodology can be used to understand the information required by dairy farmers?

**RQ_7** - What are the components of a communications framework for agricultural organisations to provide information as a service to dairy farmers?

The research questions, research objectives and the various chapters in which they are addressed are linked in the simplified research storyline illustrated in Table 1-1.
<table>
<thead>
<tr>
<th>Research Question (RQ)</th>
<th>Research Objective (RO)</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ1: What are the different communication strategies by which organisations communicate with dairy farmers?</td>
<td>RO1: Identify the different communication strategies available to dairy farmers.</td>
<td>CHAPTER 2: COMMUNICATION STRATEGIES FOR DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ2: What time frame would be most suitable when communicating with dairy farmers?</td>
<td>RO2: Determine the appropriate time frames in which to communicate with dairy farmers.</td>
<td>CHAPTER 2: COMMUNICATION STRATEGIES FOR DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ3: How can an organisation best communicate with dairy farmers?</td>
<td>RO3: Identify Best Business Practice for communication with dairy farmers.</td>
<td>CHAPTER 2: COMMUNICATION STRATEGIES FOR DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ4: What technologies are dairy farmers using to access information at present?</td>
<td>RO4: Identify the technologies used by dairy farmers.</td>
<td>CHAPTER 3: TECHNOLOGY USED BY DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ5: What information do dairy farmers require?</td>
<td>RO5: Identify the information required by dairy farmers.</td>
<td>CHAPTER 3: TECHNOLOGY USED BY DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ6: What research methodology can be used to understand the information required by dairy farmers?</td>
<td>RO6: Establish a research methodology that will provide clarity on what information service dairy farmers require.</td>
<td>CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY</td>
</tr>
<tr>
<td>RQ7: What are the components of a communication framework for agricultural organisations to provide Information as a Service to dairy farmers?</td>
<td>RO7: Propose a communication framework, using Information as a Service, for dairy farmers.</td>
<td>CHAPTER 5: PROPOSED COMMUNICATION FRAMEWORK FOR DAIRY FARMERS</td>
</tr>
<tr>
<td>RQ8: What information is required by dairy farmers to be included Information as a Service?</td>
<td>RO8: Identify the information requirements of dairy farmers for farming-related decision making.</td>
<td>CHAPTER 6: RECOMMENDATION S AND CONCLUSION</td>
</tr>
</tbody>
</table>
1.6 Research Delimitation

The research will be focused on dairy farmers in South Africa. The dairy farmers are actively farming certain sections of the provinces in South Africa. The scope of this study will be focused on the information required by dairy farmers in order to make the correct decisions in their farming operations. Communication systems utilised by organisations to communicate with their customers will be investigated. The technologies used by dairy farmers to access the Internet will be investigated. The main focus will be to develop a proposed framework for communicating information to dairy farmers as a service.

1.7 Significance of the Research

The research aims to gain insight into the information needed by dairy farmers in South Africa.

The research will also be useful in:

- Identifying communication systems needed to communicate in a proper way with dairy farmers;
- Identifying technology used by dairy farmers to make their decision making easier and more accurate; and
- Proposing a communications framework for dairy farmers by using Information as a Service.

1.8 Research Methodology and Design

The research methodology will address the research approach, data collection and data analysis. The following sub-sections will define the research approach, literature review and surveys, explain the purpose of a literature review and explain the literature review used for this study.

1.8.1 Research Approach

The research is a qualitative and quantitative study which consists of a literature review and a survey. Qualitative research focuses on the collection of data in a nominal form such as words, images, published text or transcripts of interviews. Nominal data is subjectively gathered from a selected population in order to generalise the findings from one setting to a similar setting (Gummesson, 2000).
1.8.2 Literature Review

Collis and Hussey (2014, p. 87) define a literature review as “a critical evaluation of an existing body of knowledge on a topic, which guides the research and demonstrates that the relevant literature has been located and analysed”. All the major questions and issues in the field of study should be covered by the literature used. The literature that is reviewed should be current (Collis & Hussey, 2014). The literature must contain the following: text books, journal articles, conference papers, film, presentations and lectures, legislation, archival sources, websites, dissertations, treatises and theses, in other words, any work previously published in the identified field of study.

A literature review allows the researcher to understand what studies have been conducted before, their strengths and weaknesses and significance. Previous literature reviews provide more insight into the field of study. New ideas, perspectives and approaches will stem from knowledge about the subject that the researcher has gained through literature reviews (Kumar, 2008). A current body of knowledge will be ensured by strengthening the research study through literature reviews. A thorough literature review must therefore be comprehensive, critical and contextualised and must be conducted on previous research studies, reviews of literature and theoretical articles (Hofstee, 2006).

The literature review should describe, summarise, evaluate and clarify the literature on the topic. The foundation for a respected research study is found in a thorough, substantive, sophisticated literature review that is able to advance collective understanding as well as contribute to the existing body of knowledge (Boote & Beile, 2009).

The core concepts or focus areas of a specific subject or field of study are captured in keywords. The relevant literature was acquired by using these keywords in online search fields. The researcher identified keywords before the study commenced in the field of study, and the keywords were based as general keywords as well as keywords that could be used in certain focus areas within the field of study. The search for specific literature reviews was narrowed or broadened by using Boolean operations extensively. As the research continued, the keywords were augmented.

A literature study will be performed to establish the needs of dairy farmers with regard to the communication and technology required by them. The literature study will be
conducted from secondary sources which will include on-line databases containing journals, conference papers and text books which are directly or indirectly related to the research topic.

Online publications were found by using the OPAC System (NMMU Library research system), Google Scholar and Google Books extensively. In the specific focus areas of the research study, hardcopy textbooks were used. The following advantages were presented by online search methods of academics and into other databases (Collis & Hussey, 2014):

- Ease of access from the device – The researcher gains access to the online material with ease;
- Currency – The most up to date readily available publications;
- Cross-disciplinary searching – Permits the search of multiple areas with one search;
- Flexibility – Permits the researcher to use which ever keywords he/she deems fit for the relevant search; and
- Speed – Allows the researcher to search through millions of publications in seconds for those that are relevant.

The advanced search tabs allow the researcher to list the ‘hits’ from the latest to the oldest. Publications older than the year 2000 were excluded by the advanced search. The articles were downloaded and reviewed by the researcher according to their relevance and currency. The downloaded publications were stored in their respective folders e.g. Communication Strategy articles in the Communication Strategy folder and Technology Utilised articles in Technology Utilised folder. Adobe Acrobat XI Pro was used to scrutinise each article for the researcher to highlight, comment and bookmark the relevant, important areas. The researcher could quickly and easily return to specific areas as required. The researcher discussed the processed literature reviews with the researcher’s supervisor for his input and approval.

1.8.3 Surveys

A survey is a commonly used methodology to collect primary or secondary data from a sample. The data are collected to be analysed statistically and the results are generalised to a population. An analytical survey will be conducted to determine
whether there is a relationship between pairs of variables or multiple variables (Collis & Hussey, 2014).

In this particular research a survey (questionnaire) will enable the researcher to collect data on the information needed by dairy farmers to help them in their decision-making process. The empirical study will consist of surveys (questionnaires) completed by dairy farmers in South Africa. A survey will enable the researcher to make direct contact with dairy farmers in order to establish from them how agricultural organisations need to communicate with them.

The process of collecting the primary data will be subjected to evaluation to ensure that an ethical methodology is followed. The ethical clearance will be discussed in Section 1.9.

1.9 Data Analysis

The responses from the survey will automatically be tabulated by the online service which was used to conduct the survey. Surveys that are completed by hand by the researcher with the respondents will be read into the table and used in the analysis. The data will be analysed by a statistician of the NMMU Statistical Department.

Descriptive and ANOVA Statistical methods will be utilised to analyse the collected data. Descriptive statistics will be used to summarise the data into a more compact form which will simplify the identification of patterns in the data (Collis & Hussey, 2014).

1.10 Ethics Clearance

The completed pro-forma for Ethics Clearance was submitted to the NMMU Business School. Full ethics clearance was not requested for this study as none of the criteria necessitating a full ethical clearance were met. The ethical clearance Form E is included in Appendix B.

1.11 Overview of Chapters and Structure of the Treatise

An overview of the treatise chapters, ROs and RQs is presented in Figure 1-2. The treatise is arranged as follows:

Chapter 1: Introduction and Problem Statement
Chapter 1 provides an introduction to the organisation and the research topic. The context and outline of the study are presented along with the Research Problem, Research Questions and the Research Objectives.

Chapter 2: Communication Strategies for Dairy Farmers

Chapter 2 will address research question: RQ₁, stating; “What are the different communication strategies by which organisations communicate with dairy farmers?”. RQ₂, stating; “What time frame will be most suitable when communicating with dairy farmers?” and RQ₃, stating; “How can an organisation best communicate with dairy farmers?” by performing a literature review on available information pertaining to these topics.

Chapter 3: Technology Utilised by Dairy Farmers

Chapter 3 will address research question: RQ₄, stating; “What technologies are dairy farmers using to access information at present?” and RQ₅, stating; “What information do dairy farmers require?” by performing a literature review on available information pertaining to these topics.

Chapter 4: Research Design and Methodology

Chapter 4 will outline the research methodology, which includes the research paradigm, sampling design and measuring instruments. The objective of this chapter is to address research question: RQ₆ which states; “What research methodology can be used to understand the information required by dairy farmers?”.

Chapter 5: Proposed Communication Framework for Dairy Farmers

Chapter 5 will present a proposed communication framework for dairy farmers. The chapter will address RQ₇ which states; “What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?”.

Chapter 6: Recommendations and Summary

Chapter 6 will provide a summary of the research by discussing each research question and the result findings. The contributions of this study, opportunities for
future research and limitations of the study will be discussed. Suitable managerial and practical recommendations will be made for corrective actions.

Figure 1-2 Chapter 1 Research Questions and Research Objectives
1.12 Summary

In this chapter the researcher provides background of the organisation to be studied and highlights the importance and need for the study. Key definitions, concepts and an overview of the construct of the research study were also presented. The proposed research approach, data collection and data analysis, all forming part of the research methodology, were discussed.

Chapter 2, which follows, will address RQ₁ which states; “What are the different communication strategies by which organisations communicate with dairy farmers?”. RQ₂ which states; “What time frame would be most suitable when communicating with dairy farmers?” and RQ₃ which states; “How can an organisation best communicate with dairy farmers?” by performing a review of relevant literature. Chapter 2 will achieve the research objectives of performing a literature review in order to establish the importance of identifying the different communication strategies available to dairy farmers (RO₁), determine the appropriate time frames in which to communicate with dairy farmers (RO₂) and to identify Best Business Practice (BBP) for communicating with dairy farmers (RO₃).
Chapter 2  COMMUNICATION STRATEGIES FOR DAIRY FARMERS

2.1 Introduction

An outline of the research study was given in Chapter 1 where the research questions and research objectives, which are to be investigated were introduced. In Chapter 2, a literature study will be performed to provide the required background and therefore explain the need for the research. Thereafter, a further literature study will be conducted in order to substantiate the proposed research in academic theory and identify and discuss the selected variables of the hypothesised research model.

In Chapter 2, RQ₁ will be addressed which states; “What are the different communication strategies by which organisations communicate with dairy farmers?”. RQ₂ which states; “What time frame would be most suitable when communicating with dairy farmers?” and RQ₃ which states; “How can an organisation best communicate with dairy farmers?”. The objective of Chapter 2 is to perform a literature study in order to identify the different communication strategies available to dairy farmers (RO₁); to determine the appropriate time frames in which to communicate with dairy farmers (RO₂); and to identify Best Business Practice (BBP) for communication with dairy farmers (RO₃). An overview of the RQs and ROs of Chapter 2 is presented in Figure 2-1.

The chapter starts with a discussion on different communication systems, suitable time frames and best ways to communicate with dairy farmers. A Structural overview of this chapter is presented in Figure 2-2.
Figure 2-1 Chapter 2 Research Questions and Research Objectives
The researcher will explain the different communication strategies that are available for organisations to communicate with dairy farmers. In this regard, RQ₁ needs to be answered: “What are the different communication strategies by which organisations communicate with dairy farmers?” The following sub-section will address this question.

### 2.2 Communication Systems

The following sub-sections will provide a list of communication systems used globally. Communication systems help organisations to communicate the right message that they need to bring to their customers.

#### 2.2.1 Self-Help Groups

A Self-Help Group (SHG), better known in South Africa as a Study Group (SG), is a group of 10-20 people, which meets voluntarily on an informal homogeneous, democratic manner to deal with common problems with the underlying philosophy of mutual help and collective wisdom (Rahman & Gupta, 2015). In India the following institutions are promoting SHGs all over the country: Government agencies through Swarnjayanti Gram Swarojgar Yojana (SGSY), Non-government Organisations, Banks, Development Agencies and Autonomous Bodies such as the State Institute of Rural Development (Rahman & Gupta, 2015). The SHGs have empowered the farming community on a social, economic and political level. Dairy farming is an
important activity undertaken by these groups (Rahman & Gupta, 2015). In these groups the members share their knowledge, expertise and experience with each other. The successes of these dairy SHGs depend on the extent of knowledge possessed and adoption level of improved dairy farming practices (IDFPs) by the members.

The results in studies of Rahman and Gupta (2015), done in the Kamrup district (Metro and Rural) of Assam, India on dairy farmers, showed that the majority (48 percent) of the members of the SHG belonged to a young age category, while 70 percent of the non-members were middle aged (35-50 years). Non-members of these groups are members that do not belong to any SHG and therefore do their own thing by not sharing their information about their dairy farming with these groups. The study continues by stating that members used information that was shared among members that belonged to these SHGs but non-members did not share their information with these SHGs. In South Africa a similar picture can be seen with the SGs that dairy farmers belong to. A certain percentage of a district is involved in the local SHGs while the rest of the district do their own dairy farming but do not involve a SHG. There can be more than one SHG in a district, which dairy farmers can belong to. The studies showed that younger people were more attracted to the SHG movement than older people. A study by CMD (2010) and Feroze (2009), support these findings provided above.

In the results of studies done by Rahman and Gupta (2015), it is clear that the majority of members (38 percent) had a medium level (between 49 and 56 percent) of knowledge, while non-members (86 percent) possess a low level (below 49 percent) of knowledge of IDFPs. Similar findings are also reported by Biswas; Sikdar & Goswani, (2012).

The knowledge levels of dairy farmers were positively and significantly influenced by the level of education, occupation as dairy farmers, community relations and external contact (Rahman & Gupta, 2015). Dairy farmers that had a higher level of education are more exposed to different sources of information and therefore had more knowledge of dairy farming (Biswas, et al., 2012). Their involvement as dairy farmers (occupation) facilitated clearer understanding of the problems associated with dairy farming and therefore, enhanced their practical knowledge of dairy farming.
Organisations or companies can use such SHGs to communicate with the farmers. The communication can be done in ways where information available in the organisation is shared with the group. Organisations that need to communicate with dairy farmers can use Information and Communications Technologies (ICT), to communicate with dairy farmers.

2.2.2 Information and Communications Technology (ICT)

ICT refers to technologies that provide access to information through telecommunications. ICT includes the Internet, wireless networks, cell phones and other communication mediums (Maningas, 2006).

The ways in which farmers gain access to information are being altered by the changing trends caused through ICT. In the past few decades, ICT has provided society with a vast array of new communication capabilities. Examples of advantages introduced by these new communication technologies are that people can communicate in real-time with others in different countries by using technologies such as instant messaging, Voice over Internet Protocol (VoIP) and video-conferencing. Social networking websites such as Facebook allow users from all over the world to remain in contact and communicate with one another on a regular basis.

Modern ICT has created a global village, in which people can communicate with others across the world as if they were living next door. For this reason, ICT is often studied in the context of how modern communication technologies affect society (Maningas, 2006).

The necessity to develop the capacity to generate, absorb, disseminate and protect knowledge and exploit knowledge as a powerful tool to derive societal transformation has been enforced by the “Task Force on India as Knowledge Superpower” (GOI, 2001). The flow of information and technology services delivered especially to farmers, is made available through recent developments in ICT, offering great opportunities (Maningas, 2006). The developments in ICT were necessary, because agricultural production was failing to meet the expectations of those involved. The existing public extension system was becoming less effective, more time consuming and costly, while on the other hand agriculture was becoming highly science driven and knowledge intensive (Mruthyunjaya & Adhiguru, 2005).
The socio-personal variables such as age, education, family size, and experience in dairying, land holdings, herd size, milk production, income from dairying, annual gross income, social participation and exposure to ICT showed a correlation with the ICT usage and ICT skills of the farmers, who had benefitted under the i-kisan project (Prasad Babu; Kadian; Kale & Kamala Kan, 2015). Age and family size were independent variables that had a negative and non-significant relationship with ICT skills, whereas herd size was found to have positive and non-significant relationship with ICT skills (Prasad Babu, et al., 2015). The study signified that young and middle age people had more ICT skills, as their literacy rate was higher when compared with people of older age people who lacked ICT skills due to illiteracy. Meera; Anita Jhamtani & Rao, (2004) produced similar findings in studies that were done.

Age is inversely related to the ability to find information on-line. Age has a negative significant coefficient for 12 countries, for example the probability of an individual having e-skills declines with an increase in age (Hargittai, 2002). In the same study, however, Hargittai (2002) shows that users with e-skills older than 60 are an exception and they are able to complete certain tasks faster than younger participants. The model fails to shed light on whether the negative age effect is limited by level of education attained but the demographic differences between Hargittai’s United States (US) participants and respondents from Africa make a similar result highly unlikely to the studies done in India (Hargittai, 2002). Research done by Schmidt and Stork (2008), showed that people with secondary or tertiary education are literate, while people with basic literacy who lack higher education are not able to use ICTs.

The ICT that organisations use to communicate with dairy farmers needs devices that the receiver of the communication can receive or read the information from. Mobile Technology is a method by which communication can take place.

2.2.3 Mobile Technologies

The following hand-held devices are classified as mobile devices: smart phones (mobile phones which can run customised software), Personal Digital Assistances (PDAs) or tablet computers. Applications (Apps) can be installed onto mobile devices which give additional functionality. Mobile Apps typically provide users with services, albeit in a simplified form, similar to those provided on Personal Computers (PCs). A smart phone must be capable of performing the following list of minimum
requirements: make voice calls, access the Internet, send and receive electronic mail (e-mail), access corporate database servers, send and receive Short Message Service (SMS), Multi-media Message Service (MMS) capabilities and provide Instant Messaging (IM) (Chang; Chen & Zhou, 2009). Gartner (as cited by Cox, 2013), a leading technology research company, predicted that the growth in the mobile phone market will continue, but at a slower rate to an excess of 2 billion units by 2017. Gartner (as cited by Cox, 2013), further forecasts that the sales of tablets will exceed the sales of PCs and notebooks by 72 percent by the year 2017.

The first phone call from a mobile device was made on 3 April 1973 by Dr Martin Cooper. In the four decades since this event, it has been estimated that the proportion of the world’s population that has accessed a mobile device has grown to an estimated two thirds of the population. The main reason for the growing dominance of mobile technologies has been because of better reach, convenience, functionality and lower costs (Dutta & Bilbao-Osorio, 2012). The usage of mobile phones worldwide in excess of six billion people has made it the largest ICT in history (Dutta & Bilbao-Osorio, 2012).

Organisations that could afford these technologies made them available to their customers, but the information that they shared was very limited. The information lately became more available to their customers by sharing more through their IT systems. Organisations can use their ICT systems to communicate information that they need to share with dairy farmers by using the dairy farmers - mobile phones.

2.2.3.1 Sharing of Information

The information that organisations have in their IT systems used to be extremely protected. A trend, however, has started where organisations do share their information with people from outside the organisation (Masse, 2008). The adoption of technologies and the supply of tools by organisations to their customers has resulted from this. The technologies and tools supplied by organisations allowed their customers access to and the manipulation of data within the IT systems of organisations. It was stated that shift had taken place and customers and suppliers now interact with service representatives within an organisation and interact with technology to create service experiences. The shift has been supported by research (Curren & Meuter, 2005; Meuter; Ostrom; Roundtree & Bitner, 2000).
An organisation may have all the technologies available to its customers with which it communicates but it is important to know when the customer is available to communicate with. Lately organisations share information with their customers in order to help their customers to make the right decisions for their future planning. RQ2 needs to be answered: “What time frame would be most suitable when communicating with dairy farmers?” The following sub-section will address this question.

2.3 Communication Time Frames

The following sub-sections will determine the appropriate time frames in which to communicate with dairy farmers. Lately Social media is a good way by which organisations communicate with their customers. It is important to know what the correct time frames are in which organisations must communicate with their customers.

Social media sites all differ from each other according to the time frames. Organisations or individuals need to use these time frames to their advantage when placing information on them (Gillett, 2014). The different social media sites offer different advantages for an organisation, each site has its own ways to optimisation.

Engagement on Facebook occurs between 13h00 and 16h00 (Gillett, 2014). The levels of activity peak around 15h00 on Wednesdays, while lower levels of activity are seen over weekends. The activity levels before 8h00 and after 20h00 is very low. The activity of tweets on Twitter occurs between 13h00 and 15h00, with peak posting days from Mondays to Thursdays. After 15h00 on a Friday the activity levels decline (Gillett, 2014).

LinkedIn receives lower levels of engagement during weekends, there is minimal activity on a Monday and Friday. During midweek around 12h00 and 17h00 normally sees the most engagement. Pinterest users are active on Saturday mornings and these users browse at home organisation hacks, delicious recipes and dream purchases (Gillett, 2014). The worst time frame to share a post on Pinterest is during working hours. Tumblr users are more active during night hours between 19h00 to 22h00 in the evening. Posts before 16h00 in the afternoon will attract little reaction. Google+ users will engage early in the morning with content that was posted first thing.
in the morning (Gillett, 2014). Table 2-1 shows the best and worst time frames to engage on the major social media sites.

Table 2-1 Best and Worst Time Frames for Social Media

Source: Adapted from SurePayroll, 2014

<table>
<thead>
<tr>
<th>Social Media</th>
<th>Best Time</th>
<th>Peak Time</th>
<th>Worst Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facebook</strong></td>
<td>13h00 – 16h00</td>
<td>Wednesday 15h00</td>
<td>Weekends before 8h00 and after 20h00</td>
</tr>
<tr>
<td><strong>Twitter</strong></td>
<td>Monday – Thursday 13h00 – 15h00</td>
<td>Monday – Thursday 9h00 – 15h00</td>
<td>Every day after 20h00 Friday after 15h00</td>
</tr>
<tr>
<td><strong>LinkedIn</strong></td>
<td>Tuesday – Thursday Noon 17h00 – 18h00</td>
<td>Monday and Fridays 22h00 – 6h00</td>
<td></td>
</tr>
<tr>
<td><strong>Pinterest</strong></td>
<td>Saturday mornings</td>
<td>Friday 3h00</td>
<td>Sharing during normal work hours</td>
</tr>
<tr>
<td><strong>Tumblr</strong></td>
<td>Friday 19h00 Evenings</td>
<td>Sunday – Tuesday 19h00 – 22h00</td>
<td>Before 16h00</td>
</tr>
<tr>
<td><strong>Google+</strong></td>
<td>9h00 – 10h00</td>
<td>Wednesday 9h00</td>
<td>Early mornings Evenings</td>
</tr>
</tbody>
</table>

The different time frames for the different social media websites can play an important role when organisations need to communicate with their specific audiences. An
organisation’s largest audience will dictate the time frame in which it posts information on its websites (Gillett, 2014).

Retrieving information about customers is no longer effective. People have come to hate unsolicited messages from marketers and will only fill out surveys if they can claim some offer at the end but this can taint the data. Social media give organisations the opportunity to find out about their customers in a completely non-instructive way (Jackson, 2015).

The answer to the question “What time frame would be most suitable when communicating with producers” asked in research done by Simpson (2014, p. 82), was revealed as “at their convenience”. Agricultural information needs to be provided to producers in an appropriate manner and time (Diekmann; Loibl & Batte, 2009).

Organisations now have all the information about the technology that they need to use to communicate with their customers and the preferred time frames in which communication needs to take place. The organisations now need to know the best way to communicate by answering RQ3: “How can an organisation best communicate with dairy farmers?”. The following sub-section will address this question.

2.4 Best Ways to Communicate

The following sub-sections will determine the best ways in which to communicate with dairy farmers. Social media is a good way by which organisations lately communicate with their customers. It is important to know which social media organisations must use to communicate with their customers.

Agricultural organisations should take note of the growing usage of the Internet and mobile technologies so that their farmers can be informed about the best means to get access to available information. In a study it was proved that if the correct communication methods that best suited the audience of an extension service had been used, that extension service would have improved the effectiveness of their programmes (Jones, et al., 2010). It is an advantage to know what sources farmers use to search for information about extension educators, agricultural professionals, information specialists and marketers when creating effective strategies for disseminating information to farmers (Diekmann, et al., 2009). The implementing and updating of communication strategies for extension services, may be a problem for
South African agricultural organisations, due to the extent and manner in which the Internet and mobile technology are used by the farming community (Diekmann, et al., 2009). The speed and extent to which technology is changing will also make it difficult for organisations to keep updating the ways in which they need to communicate with their farmers.

The way people access information on the Internet has changed with the introduction of mobile technologies. Currently, the most common information management tool is the mobile phone (Smith & Charen, 2011). Mobile phone usage has the following advantages namely: it improves access to information, reduces the cost of searching for information and improves co-ordination between parties and increases market efficiency (Aker & Mbiti, 2010). In a study investigating the usage of mobile technologies in the agricultural extension services done amongst farmers in the rural parts of India, 75 percent of the farmers indicated that as a result of the use of mobile phones services had improved (Fua & Akterb, 2012).

Statistically, fixed line Internet services contributes 5 percent of the South African population, whereas 98 percent of the South African population lives in areas where a mobile cellular signal is available. Mobile subscribers therefore service 93 percent of the population (World Bank, 2015). Internet usage is increasing rapidly; in 2012, 8 million South Africans accessed the Internet via their mobile devices while in the year 2016, the figure came to the 29 million mark (Internet Live Stats, 2016). In May 2015 the 3 billion mark was reached (Brown, 2015). The South African population that will access the Internet via their mobile devices will make up 52 percent of the population (Internet Live Stats, 2016). It is clear from the above mentioned statistics that mobile connectivity in South Africa should no longer be viewed as a limitation, especially with the provision of mobile information services. However, the fixed line telecommunication and Internet connectivity infrastructure in the South African Agricultural sector could present a problem because this sector is normally located in areas with relatively low or unreliable forms of these connectivity infrastructures (Simpson & Calitz, 2014).

The demands of adult South African mobile owners for increasing usage of the Internet are slicing into the networks’ voice revenues, because they are increasingly adjusting their budgets for data usage. When spending on data is compared, with spending on
voice, spending on voice has dropped from 77 percent to 73 percent. The amount spent on SMS remained steady at 12 percent.

The amount spent on data can be used as a barometer for the increase of both the number of Internet users in South Africa and of the frequency with which experienced users engage with the Internet (Goldstuck, 2012). The biggest increases in the usage of data on the mobile devices were seen in instant messaging services. A quarter of the adult mobile users was claimed from nowhere by WhatsApp, an equivalent App of BBM.

Figure 2-3 below indicates how social media has been used to communicate in South Africa.

![Figure 2-3 Social Networking and IM on mobile phones](image)

Figure 2-3 Best and Worst Time Frames for Social Media

Source: Adapted from SurePayroll, 2014

Browsing on the phone also increased substantially, from 33 percent to 41 percent of users, app downloads rose from 13 percent of users to 24 percent, while Facebook usage rose by more than half, from 22 percent to 38 percent. The Twitter user base showed proportionally, the biggest growth after BBM, which rose from 6 percent to 12 percent of adult mobile owners. The social networking genie is out of the bottle and businesses must recognise this trend in developing their strategies to address the phenomenon (Goldstuck, 2012). Social Media is starting to play a pivotal role in communication with customers.
2.4.1 Social Media

Social media are services that are created on the Internet where the users of the Internet can communicate with friends, colleagues and family. The users of these services can normally create accounts for themselves on a free basis. The researcher will name and explain a few of these services.

2.4.1.1 Twitter

Twitter is a free social networking micro-blogging service that allows registered members to broadcast short posts called tweets. Twitter members can broadcast tweets and follow other users' tweets by using multiple platforms and devices. Tweets and replies to tweets can be sent by mobile phone text message, desktop client or by posting at the Twitter.com service (Rouse, 2015b).

Tweets, which may include hyperlinks, are limited to 140 characters, due to the constraints of Twitter's Short Message Service (SMS) delivery system. Tweets can be delivered to followers in real-time and they might seem like instant messages to the novice user. Unlike IMs that disappear when the user closes the application, tweets are permanent, they are searchable and they are public. Anyone whether a member or not, can search tweets on Twitter. Twitter uses an open-source Web framework called Ruby on Rails (RoR) (Rouse, 2015b).

2.4.1.2 Facebook

Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and videos, send messages and keep in touch with friends, family and colleagues. The site, which is available in 37 different languages, includes public features such as:

- Marketplace - allows members to post, read and respond to classified ads;
- Groups - allows members who have common interests to find each other and interact;
- Events - allows members to publicise an event, invite guests and track who plans to attend;
• Pages - allows members to create and promote a public page built around a specific topic; and
• Presence technology - allows members to see which contacts are online and chat.

In each member's personal profile, there are several key networking components. The most popular is arguably the Wall, which is essentially a virtual bulletin board. Messages left on a member's Wall can be text, videos or photos. Another popular component is the virtual Photo Album. Photos can be uploaded from the desktop or directly from a smart phone camera. All interactions are published in a news feed, which is distributed in real-time to the member's friends (Rouse, 2014).

Groups on Facebook can be created between users that have the same interests and probably share the same outlook on certain situations. Farming groups as well as groups in organisations can be created. Organisations can utilise these groups to communicate certain information to the selected group that needs to be addressed. The farming groups can be a group of farmers that farm, for example, in the same district or farmers that farm with the same enterprise such as dairy farming. Facebook groups in this matter can help a group to quickly discuss a situation that needs immediate attention. Organisations involved in these groups can also create a platform to resolve certain issues.

2.4.1.3 WhatsApp

WhatsApp is a free-to-download messenger app for smart phones. WhatsApp uses the Internet to send messages, images, audio or video. The service is very similar to text messaging services however, because WhatsApp uses the Internet to send messages, the cost of using WhatsApp is significantly less than texting. WhatsApp is popular with teenagers because of features like group chatting, voice messages and location sharing (Rouse, 2013b).

With 700 million users, as of January 2015, WhatsApp is currently the biggest online messenger app on the market. Founded in 2009 by ex-Yahoo employees it started as a small start-up and swelled to 250 000 users in just a few months, growing so fast
that they had to add a charge for using the service per year to slow the subscription rate down. In 2014 WhatsApp was acquired by Facebook (Rouse, 2013b).

To use WhatsApp, a compatible smart phone or tablet with a sim card, an Internet connection and a phone number are needed. The app uses the user’s phone number as its username, and the account is locked to the phone, although contacts can be transferred to new devices (Rouse, 2013b).

2.4.1.4 Blackberry Messenger (BBM)

Blackberry Messenger (BBM) is an IM application that can be downloaded from the Internet for Blackberry smart phones and as of 2013, for iPhone and Android. BBM messages are delivered by using the Internet and employ the PIN system, by which users must share PIN numbers to communicate (Rouse, 2013a).

BBM provides easy multi-tasking with many built-in application features, allowing users to chat or share content while using the application. Although Blackberry's device sales have fallen dramatically, many BBM users agree that its instant messaging application is one of the best (Rouse, 2013a).

BBM provides dual and simultaneous application use. For example, users may view sports scores while messaging friends or even compete in digital games while chatting. A BBM profile feed displays links and even game scores on demand (Rouse, 2013a).

2.4.1.5 Google Talk

Google Talk was an instant messaging service, which was integrated with Gmail or available as a separate download. Google Talk has now been integrated with Google Hangouts. Windows users were once able to download the Google Talk application. Mac and Linux users can use many other IM applications with their Google Talk accounts or receive messages directly from Gmail. Google Talk also supports PC-to-PC voice calls (Karck, 2016).
2.4.1.6 2Go

2Go is a mobile social network of millions of people across the world and a mobile application that allows contact with friends for free. 2Go can connect to other chat networks such as Facebook, Google Talk and Mxit, and this makes it easier to keep in touch with contacts through one application (Imaralu, 2012).

2.4.1.7 Skype

Skype is an IP telephony service provider that offers free calling between subscribers and low-cost calling to people who do not use the service. In addition to standard telephone calls, Skype enables file transfers, texting, video chat and video-conferencing. The service is available for desktop computers, notebook and tablet computers and other mobile devices, including mobile phones. A number of companies, including Skype, produce dedicated Skype phones (Rouse, 2015a).

Included in the free service is a softphone application that can be downloaded to any computing device running Windows, Macintosh, Linux or Windows Mobile operating systems. A function called Skype Out enables calls to regular telephones; these calls are charged to a prepaid account or to a flat-fee annual subscription (Rouse, 2015a).

Skype's benefits, beyond the free and low-cost calls, are said to include easy set-up and good audio quality. To use Skype from a desktop computer, a user just plugs in a headset, a specialised VoIP phone or a regular phone (via an analogue telephone adapter). Contacts are added in a way similar to instant messaging and then, to calls are made by just clicking the icon next to the contact (Rouse, 2015a).

2.4.1.8 Cobweb

Over 200 000 end users across 6 000 organisations worldwide make use of the cloud service that Cobweb provides for Business and Managed Service Providers (Rouse, 2015a). It provides a 24/7 on-demand support of a range of quality end-to-end aggregated cloud services. The service provides businesses with the availability of a conferencing service which gives the end-user the flexibility of using skype instead of a browser by using Voxbone’s numbers. Cobweb’s numbers can also connect via
their phones (Rouse, 2015a). Dialling a local number, removes users’ worry about an unreliable Internet connection or an interfering firewall ruining their meeting.

The answer to the question: “In what manner can organisations best communicate with producers?” asked in research done by Simpson (2014, p. 82), was revealed through their “Preferred choice of Technology”. By understanding needs and providing the required information to individuals via their mobile phones; understanding when access is required, and finally the manner in which the information will be used, will assist in producing better-informed and more productive workers. The view is agreed in research that is not specific to agriculture (Dresner & Thomas, 2006).

Social Media is an important tool for organisations to use to communicate with the end-users that are involved with these organisations. However, the type of social media that organisations will utilise to communicate will depend on the technology that the organisations have and the preferred choice of technology that their contacts are using. The time frame in which an organisations’ contacts would like to communicate in will also dictate the type of social media that an organisation will invest in. The best way to communicate to an end-user is via their preferred choice of technology (Simpson, 2014).

The researcher will summarise Chapter 2 in the section below. The questions that the researcher needed to address in the chapter have been answered.

2.5 Summary

In this chapter the researcher identified the different communication systems that organisations can use to communicate with dairy farmers. The communication systems that were mentioned were directed at answering the following question RQ1: “What are the different communication strategies by which organisations communicate with dairy farmers?”. The communication systems can vary from Self-Help Groups to Mobile Technology. The type of communication system will depend on the systems that the organisation have available for their customers. In the past, information that organisations shared with their customers was very limited, this has changed with the availability of Information and communication systems. An organisation can also
communicate with dairy farmers via their ICT systems. Dairy farmers do have mobile phones by which organisations can communicate information to them.

Organisations need to know the most convenient time to communicate with dairy farmers. The researcher investigated different time frames to answer the following question RQ2: “What time frame would be most suitable when communicating with dairy farmers?” The timing of communication with dairy farmers needs to be convenient and depends, according to literature, on the type of social networking that the organisation might use. Different networks have different times that will be more suitable to communicate in. The time frame that will be the best to communicate with dairy farmers to will be the one that will be most convenient for dairy farmers.

Social Media appears to be the best way by which organisations can communicate with their customers. The researcher named certain Social Media sites to address the following question RQ3: “How can an organisation best communicate with dairy farmers?” An organisation that deals with dairy farmers needs to decide which Social Media site is most suitable when it needs to communicate with their dairy farmers. The Social Media site that an organisation utilises will depend on the type of technology that the organisation uses and the time frame that it wants to communicate in. Dairy farmers will use the social media that utilises the technology preferred by dairy farmers in general. Facebook will probably be one of the preferred social media services, because dairy farmers and organisations can create groups through which they can communicate with each other.

Chapter 3, which follows, will address RQ4 which states; “What technologies are dairy farmers using to access information at present?” and RQ5 which states “What information do dairy farmers require?” by performing a review of relevant literature. Chapter 3 will achieve the research objectives of performing a literature review to establish the importance of identifying technologies used by dairy farmers (RO4) and to identify the information required by dairy farmers (RO5).
Chapter 3 TECHNOLOGY USED BY DAIRY FARMERS

3.1 Introduction

In Chapter 2, the different communication strategies that organisations may utilise to communicate with dairy farmers were discussed. It was determined that the best way to communicate with dairy farmers was through social media. The type of Social Media that will be used will depend on the organisation and what requirements the dairy farmers have. The different time frames in which organisations need to communicate with dairy farmers were discussed according to the Social Media that organisations wish to utilise. The time frames identified were 13h00–16h00 on Facebook, Monday–Thursday between 13h00–15h00 on Twitter, Tuesday–Thursday on LinkedIn, Saturday mornings on Pinterest, Friday evenings at 19h00 on Tumblr and 9h00–10h00 on Google+. The chapter concluded by highlighting the best ways in which organisations are able to communicate to dairy farmers.

Chapter 3 will review literature that will assist in critically summarising the current technologies utilised by dairy farmers to access information. The chapter will specifically elaborate on what information dairy farmers need.

Chapter 3, will further address RQ4 which states; “What technologies are dairy farmers using to access information at present?” and RQ5 which states; “What information do dairy farmers require?”. The objective of Chapter 3 is to perform a literature study to identify the technologies used by dairy farmers (RO4) and to identify the information required by dairy farmers (RO5). An overview of the RQs and ROs of Chapter 3 is presented in Figure 3-1.

The chapter will investigate ways in which farmers access the Internet for information, which technologies farmers utilise to access the Internet and which applications they utilise on the different technologies they use.

A Structural Overview of this chapter is presented in Figure 3-2.
Figure 3-1 Chapter 3 Research Questions and Research Objectives
In this chapter, the different technologies that are available for farmers to access the Internet will be discussed. In this regard RQ₄ needs to be answered: “What technologies are dairy farmers using to access information at present?” The following sub-section will address this research question.

3.2 Technology Utilised to Access Information

The following sub-sections will provide a list of technologies utilised to access information globally. Technology can help farmers to access information that they need to make the right decisions to be successful in their farming operation.

3.2.1 Internet and Mobile Device Usage

Research done in the United Kingdom (UK) showed that 66 percent of adults use the Internet at home and elsewhere, while 18 percent use the Internet only at home and 4 percent only outside their homes (Ofcom, 2016). In 2015 a total of 87 percent of the adults in the UK used any device to access the Internet, either at home or elsewhere compared to 86 percent in 2014. Adults in the UK that never use the Internet at all account for 13 percent, which rises to 65 percent for adults of the age group older than 75 years old and 33 percent for adults in the age group of 65-74 years old (Ofcom, 2016). The number of South Africans actively accessing the Internet grew from 24.9 million in January 2015 to 26.8 million in January 2016, an increase of 1.9 million people. Global active Internet usage grew by, 10 percent in 2016, adding 332 million more users, while Africa saw a further 42.7 million active users being added.
In South Africa, it is estimated that 50 percent of the population use the Internet, social media across the web and mobile devices account for 24 percent, while mobile social media users account for 18 percent (htxt.africa, 2016).

The usage of tablets by adults to go online varied from 13-23 percent in 2015, depending on the online activity that the adults wanted to perform (Ofcom, 2016). All age groups prefer to use tablets and use by those aged 35-64 has doubled, while the usage by 65-74 years olds has trebled from 5 percent to 17 percent.

In 2015, 36 percent of the adults in the UK used their smartphones to gain access to the Internet, while in 2014 the percentage was 22 percent. The increase is driven by the 25-34s and 45-54s age groups (Statista, 2016). The age group of 65-74 has increased their smartphone usage to access information on the Internet from 12 percent in 2012 to 20 percent in 2014 (Ofcom, 2016). In South Africa, 84 percent of South Africans access the Internet on their mobile phones, according to a survey done by Effective Measure and the Interactive Advertising Bureau (IAB) South Africa (Alfreds, 2016). In August 2014 the percentage was 82 percent.

In Figure 3-3 and Figure 3-4 results are shown from studies done in the UK and South Africa on adults that use the Internet at home or elsewhere. The adults do have a desktop and laptop in their households, but personally uses a smartphone and tablet to access information on the Internet.

![Most Important device for Internet Access, by Device Ownership in the UK](image)

**Figure 3-3 Most Important Devices to Access the Internet in the UK**

*Source: Adapted from Statista, 2016*
Figure 3-4 Most Important Devices to Access the Internet in South Africa

Source: Adapted from htxt.africa, 2016

Farmers are gaining access to information in different ways that are made possible by ICT which was mentioned by Simpson, 2014. People are accessing information using various devices such as PCs, Laptops, Note books and mobile phones. According to Aker and Mbiti (2010), mobile phones have the following advantages that people are starting to utilise:

- They can improve access to information;
- They reduce the cost of searching for information;
- They improve coordination between parties; and
- They increase market efficiency.

The importance of having information available to organisations on how farmers are searching for information on the Internet has been noted by Diekmann, et al. (2009). The information has many advantages when creating effective strategies for sharing information with farmers concerning extension educators, agricultural professionals, information specialists and marketers (Diekmann, et al., 2009).

The implementing and updating of communication strategies for extension services, may be problematic for South African agricultural organisations due to the extent and manner in which the Internet and mobile technology are used by the farming
community (Diekmann, *et al.*, 2009). In a study done on an Information Services Framework for Commercial Extension Services by Simpson (2014), an Internet and Mobile Device Usage Survey (IMDUS) was conducted in order to:

- Explore the Internet access profile of producers;
- Determine which devices are used for Internet access by farmers; and
- Understand the purpose for which mobile technology is used in the South African farming community.

Farmers associated with the South African agricultural community were targeted in the survey. The results will be discussed in Section 3.2.2. The researcher of this study conducted a similar survey that targeted specifically the dairy farmer. The results of the study will be presented in Chapter 5.

### 3.2.2 Internet Usage

The results of a survey conducted on South African farmers showed that mobile technology was the preferred method to access the Internet (Simpson & Calitz, 2014). In the survey the respondents indicated that 47 percent of the respondents had a mobile Internet connection, 36 percent of the respondents had a wireless connection and 18 percent of the respondents had a fixed line connection (Simpson & Calitz, 2014).

In the research done by Simpson (2014), results indicated that 68 percent of the respondents accessed the Internet via their Laptop computers, 57 percent of the respondents accessed the Internet via their mobile phones, 46 percent of the respondents accessed the Internet via their PCs and 37 percent of the respondents accessed the Internet via their tablets. The respondents indicated that they use more than one device to access the Internet. The acceptance of mobile technology for Internet access can be seen in the high percentage usage of mobile phones and tablets (Simpson, 2014).

The research done by Simpson (2014), indicated that 79 percent of the farmers use the Internet to source information. The importance of these results must not be underestimated. Agricultural organisations should use the Internet as a source of information (Simpson, 2014). The results of the research done by Simpson (2014), is
in contrast to the findings of the research done by Stone and Terblanche (2012), Villamil; Alexander; Silvis & Gray (2012) and Diekmann, *et al.* (2009), who found that producers gave Websites relatively low priority for when seeking information. The research by Simpson (2014) indicated that the Internet was also used for the following: news (56 percent of the respondents), social media (48 percent of the respondents), sport results (19 percent of the respondents), gaming (9 percent of the respondents) and other activities (9 percent of the respondents). The research therefore indicates that the agricultural community is using the Internet for business-related activities, making it a technology requiring attention by agricultural organisations.

3.2.3 Devices for Internet Access

The PDA was the first commercial successful mobile device, post PC application (Allen, 2003). The interest in PDAs declined after 1994, because of a number of failures in the technology. The evolution of the smartphone started in the development of the PDAs that contributed to computing power, processing power, storage and software of mobile phones (Allen, 2003).

The components of a mobile device consist of the following: the processing unit, input devices and output devices. The generic term used for new-generation mobile devices is smartphones which exists in parallel with earlier generation phones known as feature phones. Smartphones are differentiated from feature phones in that they have a larger screen, wireless synchronising abilities, extended keyboard, touch screens, a more powerful processor, more storage capacity and full web browser functionality (Andersson, 2012).

In the survey done by Simpson (2014), the usage of mobile phones by farmers, indicated that the South African farming community is accepting the functionality of the smartphone. Two thirds of the farmers that were surveyed said that they are accessing the Internet by their mobile phones.

The reported features that the farmers used and the ranking of these features further support this notion. The survey also indicated that 62 percent of the respondents used their mobile devices for email and 43 percent of the respondents used them for apps, these features are available on smartphones and tablets (Simpson, 2014).
The following are makes of smartphones: Samsung, Apple, HTC, One Plus, Huawei, Motorola, LG, BlackBerry, Nokia and Sony (Hall, 2016). The developers that create apps that are used on these smartphones need to be cognisant of the different types of devices (Simpson, 2014).

The survey indicated that Samsung (31 percent) was the most popular device, followed by BlackBerry (29 percent), Nokia (21 percent) and Apple (12 percent). Developers of agricultural applications in South Africa should make an attempt to cater for at least the top four brands, namely: Samsung (Android), BlackBerry (BlackBerry OS), Nokia (Windows Mobile) and Apple (Apple OS) (Simpson, 2014). BlackBerry has since the research done by Simpson, 2014, disappeared from the market.

Since the 1990s tablets or tablet computers, which is a form of mobile technology, have been available. Tablets consist of a large touch screen that covers a processor unit, referred to as “slates” where the primary input is through the screen via a stylus or finger, although external keyboards may be attached (Atkinson, 2008). Atkinson (2008) classified tablet computing as a failed technology in 2008. The opinion has changed dramatically, since the revolution of the iPad (Apple’s tablet computer), which was launched by Apple CEO Steve Jobs in January 2010 (Halpern, 2010). Apple and the generic models using Google’s Android operating system are the two types of tablets that are dominating the tablet market. Developers working on agricultural applications would have to cater for these dominant platforms, namely: Apple and Android, just as in the case of mobile phones.

Tablets are used in the same way as smartphones to access the Internet as well as to run Apps designed for specific purposes. The agricultural community has adopted the use of tablets primarily for business purposes. Email, business, banking and information are the top four categories for tablet computers used by farmers (Simpson, 2014; Haßler, Major & Hennessy, 2015).

The primary usage pattern of tablet computers is similar to that of mobile phones, although subtly different. The tablet computers are primarily used for mobile technology of business-related activities followed by social usage and gaming (Simpson, 2014; Haßler, Major & Hennessy, 2015). The respondents in the survey done by Simpson (2014) indicated that their use of tablets supports the development of this technology in creating applications for the agricultural community.
Organisations know that farmers are using smartphones and tablets to access information on the Internet. The agricultural organisations need to spend time in the development of the correct agricultural applications that can be utilised by these mobile technologies (Simpson & Calitz, 2014). Agricultural organisations now need to know what are the information requirements for dairy farmers by answering RQ5:” What information do dairy farmers require?”. The following sub-section will address this question.

3.3 Information Requirements for Dairy Farmers

The following sections will provide the information requirements that dairy farmers need. The information that dairy farmers need to make the correct decisions is vital in their day-to-day decision making, because with the right information the dairy farmer will be able to make a profit in his farming enterprise.

The production systems of dairy farmers worldwide need to be able to combine profitability with the responsibility of protecting human health, animal health, animal welfare and the environment (FAO & IDF, 2011). Dairy farmers, as the primary producers in the supply chain, should also be given the opportunity to add value to their product by adopting methods of production that satisfy the demands of processors and customers.

Information that agricultural organisations make available to dairy farmers via the organisations’ ICT systems should give dairy farmers proactive guidance on how to achieve certain objectives on their farms (FAO & IDF, 2011). The information should be available in a format through which the dairy farmer can engage in the production of milk from any recognised, milk-producing cows. The information when adopted should support the production and marketing of safe, quality-assured milk and dairy products (FAO & IDF, 2011).

Dairy farmers need information on the following key aspects:

- Animal Health;
- Milk Hygiene;
- Nutrition (Feed and Water);
- Animal Welfare;
- The Environment; and
• Socio-economic Management.

These practices have been drawn from the best-practice guidelines and existing assurance schemes around the world. The individual practices will vary in their applicability to various dairy regions (FAO & IDF, 2011). The guidelines will not legally bind dairy farmers but they are encouraged to implement the guidelines that have relevance to their own situations. The objective of information that agricultural organisations supply to dairy farmers is to produce safe, high-quality milk from healthy animals by using management practices that are sustainable from an animal welfare, social, economic and environmental perspective (FAO & IDF, 2011).

Agricultural organisations need to focus on the key practices that dairy farmers need to adopt in order to produce good and safe quality milk. Information that agricultural organisations make available to dairy farmers will guide them in making the correct decisions on their farms.

The following sub-sections will explain by guidelines the information that is required by dairy farmers.

3.3.1 Animal Health

Dairy farmers need to have an effective health-care programme in place that will ensure that animals produce milk that is healthy for human consumption (Morton, 2007). The national, international or market demands will guide the dairy farmer in which of the practices are applicable, because not all of the practices in animal health care are applicable in all circumstances (FAO & IDF, 2011). Dairy farmers can use the following guidelines for good dairy farming practices with regard to animal health (Milk SA, 2014):

- Establish a dairy herd with a resistance to disease;
- Prevent entry of disease onto the dairy farm;
- Have an effective herd health-management programme in place; and
- Use all chemicals and veterinary medicines as directed.

The information required on animal health can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.
3.3.2 Milk Hygiene

On a dairy farm milking is a defining activity. A high standards of milk quality is demanded by consumers and therefore milking management aims to minimize microbial, chemical and physical contamination (Muller & Robertson, 2010). All aspects of the process of obtaining milk quickly and effectively from dairy cows are covered by milking management, while assuring that the health of the dairy cows and the quality of the milk are of the standard required (Petzer, 2003). Consistency in the day-to-day implementation of the milking procedures is an important part of good dairy farming practice for milking (Petzer, 2003). The practice of milk hygiene ensures that milk is produced and stored under hygienic conditions and that the milking equipment used to produce and store milk is well maintained (Muller & Robertson, 2010). Dairy farmers can use the following guidelines for good dairy farming practices with regard to milk hygiene (Petzer, 2003):

- Ensure that milking routines do not injure the dairy cows or introduce contaminants into the milk;
- Ensure that milking is carried out under hygienic conditions; and
- Ensure that the milk is handled properly after the milking procedure.

The information required on milk hygiene can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.

3.3.3 Nutrition (Feed and Water)

The health and productivity of dairy animals are determined by the quantity and quality of the feed and water that they consume (Morton, 2007; Milk SA, 2014; Herdt, 2014). The feed and water that dairy animals consume also determine the quality and safety of the milk that they produce. Dairy farmers can use the following guidelines for good dairy farming practices with regard to nutrition, both feeding and watering (FAO & IDF, 2011):

- Secure feed and water supplies from sustainable and reliable sources;
- Ensure animal feed and water are of suitable quantity and quality;
- Control storage conditions of feed; and
- Ensure the traceability of feedstuffs brought onto the farm.
The information required on nutrition (feed and water) can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.

3.3.4 Animal Welfare

The application of sensible and sensitive animal husbandry practices to the livestock on the farm is in essence animal welfare. Animal welfare is primarily concerned with the wellbeing of the animal (FAO & IDF, 2011). Consumers perceive good animal welfare standards as an indicator that food is safe, healthy and of high-quality. The standards for animal welfare have been incorporated into most on-farm food quality and food safety schemes (Du Preez & Malan, 2011). Animal welfare codes normally list five freedoms that should underpin the best farm practice in relation to animal welfare (Morton, 2007). These five freedoms provide a comprehensive overall concept of animal welfare. Dairy farmers can use the following guidelines for good dairy farming practices with regard to animal welfare. They are set out to reflect the five freedoms (Morton, 2007):

- Ensure that animals are free from thirst, hunger and malnutrition;
- Ensure that animals are free from discomfort;
- Ensure that animals are free from pain, injury and disease;
- Ensure that animals are free from fear; and
- Ensure that animals can engage in relatively normal patterns of animal behaviour.

The information required on animal welfare can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.

3.3.5 The Environment

Consumers are increasingly concerned that the production of food is sustainable and is undertaken in harmony with the environment (Muller & Robertson, 2010; FAO & IDF, 2011). It is therefore important for dairy farmers produce milk in a way that they can meet the expectations set by the wider community. These expectations can be met by using natural resources efficiently and by minimizing any adverse impact on the environment (Du Preez & Malan, 2011). Every dairy farmer, by adopting management practices, can play a role in protecting their industry and the future of
their enterprise that will enhance the environmental sustainability of their farming system. Dairy farmers can use the following guidelines for good dairy farming practices with regard to the environment (Herdt, 2014):

- Implement an environmentally sustainable farming system;
- Have an appropriate waste management system; and
- Ensure that the dairy farming practices do not have an adverse impact on the local environment.

The information required on the environment can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.

3.3.6 Socio-economic Management

Two characteristics of good farming practices are being socially responsible and economically sustainable as they address two key risk areas to the farming enterprise (Milk SA, 2014). It is critical to the sustainability of the farming enterprise to manage and look after the farm’s human resources. In many parts of the world this will primarily apply to the farmer and others living on the dairy farm (Du Preez & Malan, 2011). However, dairy farmers must also consider the role their enterprise has in the wider community; as an employer, consumer of natural resources and its potential impact on the neighbours. Similarly, dairy farms are businesses producing a product, in this case milk, meat and livestock. Like all businesses, dairy farm businesses must be financially viable to have a long term future. Dairy farmers can use the following guidelines for good dairy farming practices with regard to socio-economic management (Milk SA, 2014):

- Implement effective and responsible management of human resources;
- Ensure that farm tasks are carried out safely and competently; and
- Manage the enterprise to ensure that it is financially viable.

The information required on the environment can be made available to dairy farmers by means of communication systems discussed in Sections 2.2.1–2.2.3.

The researcher will summarise Chapter 3 in the section below. The questions that the researcher needed to address in the chapter have been answered.
3.4 Summary

In this chapter the researcher identified the different technologies that dairy farmers can utilise to access information. The technologies that were mentioned were directed at answering the following question RQ4: “What technologies are dairy farmers using to access information at present?”. The technology used to access information consist of Laptops, Smart Phones, Tablets and Desktops. The type of technology used by the dairy farmer will depend on the preferred technology that the dairy farmers are comfortable with. Dairy farmers have adopted the usage of smartphones from which they can do virtually all their business-related tasks. Agricultural organisations will need to pay attention to the development of agricultural applications that can be used with the technology by which dairy farmers are accessing information.

Organisations need to know the information requirements that dairy farmers have. The researcher investigated the different information requirements to answer the following question RQ5: “What information do dairy farmers require?”. Agricultural organisations provide information which dairy farmers need, to give them the correct guidance in performing good farming practices in order to produce safe, high-quality milk. Dairy farmers can adopt any of these guidelines depending on their own situation. Dairy farmers will not be legally bound by these guidelines, but they will ensure that dairy farmers make the correct decisions for their farming enterprises. Dairy farmers require information on the following subjects: Animal Health, Milk Hygiene, Nutrition (Feed and Water), Animal Welfare, The Environment and Socio-economic Management.

Chapter 4, which follows, will address RQ6 which states; “What research methodology can be used to understand the information required by dairy farmers?” by performing a review of relevant literature. Chapter 4, will achieve the research objective of performing a literature review in order to establish a research methodology that will provide clarity on what information service dairy farmers require (RO6).
Chapter 4  RESEARCH DESIGN AND METHODOLOGY

4.1  Introduction

In Chapter 3 the researcher explored the different technologies that dairy farmers use to access information. In the literature, mobile devices were highlighted to be one of the technologies that dairy farmers use to access information. The use of mobile phones and devices has a number of advantages that will benefit both the dairy farmers and agricultural organisations.

In Chapter 4 a comprehensive explanation of the research design and methodology followed in this treatise will be provided, which will aid reproduction in future studies. In this chapter, the layered approach of the Research Onion (Figure 4-3) will be used to explain the research design and methodology. The following sections will be explained: research philosophy, research approaches, research strategies, time horizons, techniques and procedures.

Chapter 4 will address RQs which states; “What research methodology can be used to understand the information required by dairy farmers?”. The identification of the research methodology that has been applied to this study will be the main deliverable of this chapter. A suitable research methodology for this study will be extracted and presented from the current research methodology practices. An overview of the RQs and ROs of Chapter 4 is presented in Figure 4-1.

The research design will be highlighted in Chapter 4 by means of the Research Onion (Figure 4-3). The chapter will commence with a discussion on what is meant by research and what research design will be used for this study. The chapter will conclude by summarising the research methodology followed for this treatise. A Structural Overview of this chapter is presented in Figure 4-2.
Figure 4-1 Chapter 4 Research Questions and Research Objectives
4.2 Research Defined

A systematic method, which is classified as the basic term for research, needs to be followed to find answers to questions. Research is an original contribution by each researcher to ensure the progression of knowledge (Kumar, 2008). Research is focused on the quest for truth with the aid of study, observation, comparison and experiment (Kumar, 2008). Therefore, research is the search for knowledge by means of applying objective and systematic methods of identifying and presenting a solution to an identified problem. The system approach concerning the preparation of a theory and generalisation is also part of research (Kumar, 2008). Research is identified by three characteristics (Saunders; Lewis & Thornhill, 2012):

- Data are collected systematically;
- Data are interpreted systematically; and
- There is a clear purpose to find things out.

A number of key points need to be present for a study to be classified as research. The following key points need to be presented (Kumar, 2008):

- The study must be an original contribution to the existing body of knowledge;
• The purpose of the study must be to raise questions and then apply scientific and systematic procedures to obtain the answers to these set questions;
• The investigation must be on a specific subject or specific field of knowledge; and
• The research must be undertaken to establish principles or facts.

4.3 Research Design

The process that is used to test the treatise statement (Section 1.3), by identifying and discussing the overall design or structure, is called the research design (Krippendorff, 2012). The main thesis statement is answered as clearly as possible with the obtained evidence (data) that has been collected by the researcher. Therefore, before collection or analysis commences, the evidence needs to be identified which must answer the research question, test the theory, evaluate the programme or correctly describe the phenomenon (De Vaus, 2005). The researcher can only focus on how the evidence will be obtained after the required evidence has been identified.

A sound and systematic research process needs to be followed while obtaining the evidence for the research to contribute as a noteworthy scientific contribution. The research design can be explained and justified by using the Research Onion (Figure 4-3) as a guideline. The Research Onion (Figure 4-3) provides the necessary context and boundaries within which the researcher must select the correct evidence, collection techniques and procedures to analyse the research (Saunders & Tosey, 2013).

The process of peeling the layers of the onion, as described by the analogy used by Saunders, et al. (2012), will be used in this chapter whilst considering the implications of methodology choice, strategy and the time horizon for design. In Figure 4-3, the layers of the Research Onion are presented. The research philosophy that is applicable for this study is identified by the focus of the outer layer of the Research Onion which focuses on identifying the applicable philosophy needed (Section 4.4). The second layer focuses on identifying the research approach to be used in this research study (Section 4.5). Deductive or inductive approaches are included in these approaches. The research strategy utilised in this research study is identified in the third layer of the Research Onion (Section 4.6). How the research questions will be answered or addressed will thus be highlighted. The time horizons used in the
research study are identified in the fourth layer of the Research Onion (Section 4.10). The last layer or inner core of the Research Onion focuses on identifying the techniques and procedures used for the data collection and data analysis of the research study (Sub-sections 4.6.1.4 – 4.6.1.6).

The researcher will explain in detail the construction of the survey used in this study. The data collection and data analysis will be described. The time horizons, which are true to the research strategy will conclude the research onion’s description. It should be noted that the investigation was followed according to Research Onion and thereafter, the findings were logically grouped to contribute to the flow of the research study. The final process flow adopted for this study will ensure that the research strategy with data collection and data are elaborated on in full before concluding this chapter.

Figure 4-3 The Research Onion
Source: Adapted from Saunders & Tosey, 2013, p. 59

Research options selected will be discussed in the following sections, the three research philosophies will be explained and the research philosophy utilised in this study will be identified.
4.4 Research Philosophy

Research philosophy is the first layer of the Research Onion. The advancement of knowledge and the nature of that knowledge comprises philosophy. Research philosophy is built around the assumptions by which the researcher, and consequently the research study, view the world. A factor which determines the viewpoint of research philosophy is how the researcher views the relationship between knowledge and the process by which it is developed. Some researchers may be concerned with facts while other researchers may be concerned with feelings and attitudes (Saunders, et al., 2012).

Research philosophy has three paradigms by which the thinking can be directed: Positivism, Interpretivism and Realism. There are important differences between the three philosophical stances, which influence the way the research process is addressed. The following sub-sections will discuss the three major ways of thinking, starting with the positivism way of thinking.

4.4.1 Positivism

The positivism way of thinking adopts the philosophical stance of natural science, meaning that the researcher will prefer to work in an observable, social reality which will lead to the construction of credible data. The researcher is external or independent to the process of data collection and can therefore neither influence nor be influenced by the subject of the research. A hypothesis will then be tested and either accepted or not accepted, in whole or part. The further development of the theory will be implemented, which will be tested by further research. In this research study the researcher has adopted the positivist way of thinking. The following sub-section will discuss the interpretivism way of thinking.

4.4.2 Interpretivism

The interpretivism way of thinking adopts the stance that the social world is far too complex to be defined by a set of generic laws. The researcher will be allowed by this approach to gain insight into the complex world that will allow him or her to view the context and the situation as they differ from each other. In the positivist way of thinking it is argued that insight is forfeited. An empathetic stance has to be taken by the researcher when the way of thinking is interpretivism, which is a critical aspect of this
way of thinking. The social world of the subject being researched is entered by the researcher and he or she tries to understand the world from the subject's point of view. A deeper understanding of the subject's motives, actions and interactions is gained. Interpretivism is relevant in the ever-changing business and management research areas, especially in the field of marketing, organisational behaviour and human resources management (Saunders, et al., 2012). The following sub-section will discuss the realism way of thinking.

4.4.3 Realism

The realism way of thinking is similar to positivism, a way of thinking that relates to a scientific approach to the development of knowledge which is focused on the fact that reality is independent of the human mind and beliefs. Realism emphasises that objects have an existence independent of the human mind and identifies what the human senses can sense as the truth (Saunders, et al., 2012). Realism differs from positivism, in that it argues that no form of science relies exclusively on observable empirical evidence. Realism emphasises that there are always hidden aspects of any form of reality that are hidden beneath the observed subject. The hidden aspects should be revealed that bring about observable regularities (UK Essays, 2015).

The research philosophy of positivism as previously indicated, will be utilised in this research study. The researcher adopts the research philosophy of positivism, because the researcher will be externally independent of the process of data collection and can therefore neither influence nor be influenced by the subject of the research. The collected data will therefore be more reliable.

The research approaches and the research approach utilised in this research study will be discussed in the following section.

4.5 Research Approaches

The second layer of the Research Onion focuses on the research approaches. Deductive and inductive reasoning are two broad approaches that are used in research. Figure 4-4 is a graphic illustration of the two research approaches were their differences are portrayed.

A top-down approach that works from the more general to the more specific is referred to as the deductive approach. A more specific hypothesis can be tested at the end
after a theory about a topic is constructed and subsequently narrowed down. Observations are collected to address the hypothesis after a process of further narrowing has taken place. The researcher tests the hypothesis with specific data on the identified theory (Aqil Burney, 2008).

A bottom up approach that moves from a more specific observation to a broader generalisation and theories, refers to an inductive approach. A specific observation is made by this approach. Thereafter patterns and consistencies are detected which allow for the formulation of a hypothesis that can be explored. The development of some general conclusions or theories is the end result (Trochim, 2006).

In this research study, inductive reasoning will be adopted as the study moves from a more specific observation to broader generalisation and theories.

The research strategy utilised for this research study will be discussed in the following section.

**Figure 4-4 Inductive vs. Deductive Reasoning**

*Source: Adapted from Trochim, 2006*
4.6 Research Strategies

The focus in the third layer of the Research Onion is on research strategy. In the research process, the research strategy stipulates how the research must be conducted. The research strategy originates from the research questions and clearly identifies the focus areas or research objectives which must be addressed before the research is complete. The research strategy needs to take account of the risks involved in conducting the research study by a mitigation of processes to address these risks and to achieve the research objectives. The planning, execution and monitoring of the research study is guided by the research strategy with the emphasis on the research methodology’s strengths, weaknesses and constraints (Krippendorff, 2012). The research strategy will adopt the usage of an existing theory to develop an hypotheses (Saunders, et al., 2012).

The following research strategies can be used by which research can be conducted (Saunders & Tosey, 2013):

- Experiment;
- Survey;
- Case Study;
- Grounded Theory;
- Ethnography; and
- Action Research.

The objectives for this research study have been achieved by utilising a survey that was constructed by using information from previous surveys. The survey that was used is Information as a Service for Dairy Farmers Survey (IaaSDFS, Appendix C). In the following sub-sections the researcher will elaborate on the survey.

4.6.1 Information as a Service for Dairy Farmers Survey

The following sub-sections will define the research survey and elaborate on the survey description, survey scale, validity and reliability, survey respondents, survey distribution and data analysis of the IaaSDFS.

4.6.1.1 Surveys Research Defined

The required information that is needed by a research study is collected through a limited, but reliable number of individuals (sample). The methodology used to collect
primary or secondary data is called a survey. A survey is, in general, associated with positivist studies. The collected information of a study is intended to generalise the information to a defined body of people (population). The information collected when using surveys is valuable when a need occurs to gain insight into the opinions, desires and attitudes of a defined body of people. Highly structured questionnaires in the form of surveys can be structured as follows: postal and Internet self-completion questionnaires, to unstructured in-depth interviews such as telephone and face-to-face-interviews (Collis & Hussey, 2014; Hofstee, 2006). The research study used Internet-based questionnaires to collect the required data.

4.6.1.2 IaaSDFS Description

The benefits of participating in the research study for both the respondent and the industry were stated in the covering letter. The covering letter to the respondents of the IaaSDFS introduced the topic, field of study, background and purpose of the study. The expected time to complete the research study and the importance of the study were highlighted in the introduction of the IaaSDFS. In the introduction it was emphasised that the respondents’ personal information would be kept confidential and that participation would provide automatic consent. The researcher’s contact details were provided. See Appendix C – IaaSDFS.

Microsoft Word 2013 was used to create IaaSDFS. The way in which the survey was structured forced the respondents to follow the programmed question structures. The questions were kept to a minimum to keep the survey focussed on the outcome. The questions appeared to be straight-forward and therefore very little assistance or guidance was required from the researcher.

The IaaSDFS were divided into ten sections.

Section 1: Biographical Information captured the respondent’s biographical information which included, Age, Gender, Language and Province in which the respondent farms. The main areas in this section compared to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 2: Captured the General Farming Practices that the respondent practised on the farm. The questions asked in this section differed from the questions asked in the
processed PhD research, because the questions had to be relevant to dairy farming practices.

Section 3: Collected information that was regarded as important for dairy farmers. The questions asked in this section differed from the questions asked in the processed PhD research, because the questions had to be relevant to dairy farming practices.

Section 4: Information about Agricultural Organisations was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 5: Information about Customer Satisfaction was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers, but adapted by using the company name of De Heus.

Section 6: Information on the usage of the Internet by the respondents was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 7: Information about the usage of Mobile Devices by the respondents was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 8: The use of Applications (Apps) by the respondents was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 9: Information that Dairy Farmers required was collected. The section had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

Section 10: The survey concluded with personal details of the respondents which included their Name, Telephone Number and Email address. The majority of the questions were in the form of structured questions such as multiple choice and 5 point Likert Scale type questions. Additional open-ended question boxes were added to selected fields to allow the respondent to elaborate on some answers. The section
had the same questions to the survey that was used in the processed PhD research study conducted amongst grain producers.

4.6.1.3 IaaSDFS Scale, Validity and Reliability

The structure of the questions stems from a previously processed PhD research study created by Simpson (2014). The main research objective was to develop and evaluate an Information Services Framework (ISF) for organisations offering information as Commercial Extension Services (CES) (Simpson, 2014). The survey was analysed, updated and amended to suit the requirements of this study.

The new survey (IaaSDFS) was based on the information required by dairy farmers, which differed from the survey of Simpson (2014), which focused on the information required by grain producers in South Africa. Each section in the survey covered questions relevant to the specific practice of dairy farming that the researcher needed information about. For example, the section of the survey on Internet Usage related how dairy farmers use the Internet to access information that they require for making decisions in their farming operations. The Internet resources were listed, and the respondents had to indicate if they used them, and in some cases, how they used them.

The scales that were used ranged from closed questions, such as multiple choice, to multiple choice, ranking, intensity rating scales and open questions. The surveys also used 5 point Likert scale questions and questions that required answers from Strongly Disagree to Strongly Agree. The questions in the survey were kept structured and all were mandatory, excluding the questions that were not dependent on a previous response. The respondents were asked to give their view on the respective questions. These questions were formulated to address each identified topic or area and ensured that the relationship to the primary research question and the two secondary research questions was maintained.

The survey was then verified by Professor André Calitz and Doctor Danie Venter. Professor André Calitz is the supervisor of this study and Doctor Danie Venter the NMMU statistician. The following sub-sections will elaborate on the survey respondents and data collection.
4.6.1.4 IaaSDFS Respondents

The focus of the fifth layer of the Research Onion is to identify the techniques and procedures used for data collection and data analysis. The respondents in the population group are dairy farmers. The sample used in the survey had to be dairy farmers as these respondents are the only individuals who can indicate which information they require.

The IaaSDFS required one dairy farmer or responsible person who manages a dairy farm to complete the survey. Dairy farmers in the different provinces of South Africa were the target audience. Contact with dairy farmers was achieved through a committee titled the Milk Producers Organisation (MPO) who were approached to assist with the research to their access to relevant individuals. The MPO is a platform to which all the dairy farmers in South Africa are affiliated. The MPO serves as the first means of reaching the dairy farmers. In addition to the MPO, the survey was sent to dairy farmers situated in the areas where the researcher and his colleagues have business relationships.

A list containing contact details of the remaining dairy farmers was generated and used as an additional method of direct contact. The list of contact details allowed the researcher to communicate with the respondents directly.

There was only one precondition set for respondents to qualify for participation in the study. The respondent had to be a dairy farmer in South Africa. The required information needed for the survey was then collected by dealing with the correct respondent.

4.6.1.5 IaaSDFS Distribution

Microsoft Word 2013 was used in creating the IaaSDFS, by using the Design Mode Function of the programme. Using the Design Mode Function ensured that the answer fields were editable. Hard coding of the questions was done, in the order in which the questions were asked. Once questions were answered, the captured field automatically jumped to the next questions’ answer field. Therefore, the survey could be answered and completed in a quick and easy process.

The survey was emailed to the respondents by distribution and collection method. The IaaSDFS was attached to the covering letter in the form of a link that the respondents
could follow to complete the survey. The survey was sent to the MPO for distribution. The MPO has all the dairy farmers of South Africa on its data base. The MPO distributed the email to 325 dairy farmers. The researcher emailed the covering letter with the link to the survey to dairy farmers in the area in which he does business. The researcher asked his colleagues to distribute the e-mail amongst the dairy farmers in the areas that they operate. The number of questionnaires that was completed via the Internet by the respondents was not sufficient. Further research was conducted by printing the questionnaire which respondents completed. The minimum requirements for reliability and validity were achieved through the eventual sample size of the survey. The IaaSDFS distribution email can be seen as Appendix D. The set preconditions were met by the respondents.

4.6.1.6 IaaSDFS Data Analysis

Microsoft Excel was used to capture the data from the IaaSDFS by the respondents. The researcher transferred, processed and tabled the data into Microsoft Excel. The data that was tabled were examined for incompleteness and corrupt records were removed from the dataset. A NMMU statistician, Dr Danie Venter analysed the data. Conclusions were drawn from the analysed results after descriptive and inferential statistic techniques were used.

The set scope of the research study was ensured by analysing the findings on the most important and relevant findings. The findings were rounded off to Zero for visual purposes, however, the calculations were done before the documented analysis was rounded off. The reliability of the instruments was established by calculations on Cronbach alphas. The following sub-sections will elaborate on the research strategy for the IaaSDFS.

4.6.2 Strengths and Weaknesses of the Data Collection Methods Used

The online survey distribution and collection methods used in this study have the following strengths (Gingery, 2011; Sincero, 2012; Wyse, 2012):

1. Administration is easy;
2. It will reflect in real-time and can be easily changed;
3. The process can be easily monitored;
4. Gathering of data is easy (reach large numbers quickly);
5. It is inexpensive;
6. Data is collected, handled and processed automatically;
7. Survey platforms are relatively free from errors;
8. It can be completed at the respondents own pace which increases the response rate, when they have time and in their preferred access medium; and
9. The design is flexible.

The online survey distribution and collection methods used in this study have the following weaknesses (Gingery, 2011; Sincero, 2012; Wyse, 2012):
1. Absence of the interviewer (when uncertainty is experienced and there is lack of clarification and when methods are probed);
2. Difficulty in reaching a challenging population and problems with cooperation;
3. Respondents may not feel encouraged to provide honest and accurate answers; and
4. Misinterpretation of questions.

The following section will discuss the statistical methods that were followed in this research study.

4.7 Statistical Methods

Completed open-ended questions were collected in order to analyse the qualitative data which is based on an interpretative research philosophy. The analysis and interpretation of the data were done once the data had been captured, categorised, coded and sorted. Conclusions will be drawn and accommodated by a narrative summary once patterns and relationships are recognised.

The quantitative data were analysed by using both descriptive statistics and inferential statistics. Descriptive statistics is used to organise, summarise and extract essential information and turn it into meaningful information. The measurement of descriptive statistics is focussed on the central tendency and spread of the data. Mean, mode and median are categorised under central tendency, while range, quartiles, absolute deviation, variance and standard deviation are categorised by spread (Wegner, 2012).

The statistical analyses included the Cohen’s d practical significance test, chi² test with Cramér’s V test for practical significance and the paired difference t-test.

The measurement for practical significance of inferential tests that is based on the groups’ mean was tested by Cohen’s d practical significance test. The test focusses
on by how many standard deviation intervals the means of the experimental groups fall below or above the control groups mean (Rubin, 2013, p. 91). The Cohen’s d test utilises the following interpretation intervals: Not Significant < 0.20, Small: 0.20 < |d| < 0.49, Medium: 0.50 < |d| < 0.79 and Large: |d| > 0.80. The Cohen’s d test will be used on a number of questions included in the survey used in this study (Gravetter & Wallnau, 2009, p. 264).

The detection of patterns such as relationships between variables occurring by chance alone is tested by the significance testing method. The degrees of freedom (df) and the probability (p-value) are the variables used in significance testing. A statistical significance exists between the variables when the p-value is < 0.05. No statistical significance exists between the variables when the p-value is ≥ 0.05. When conducting statistical significance of relationships between variables, the sample size is imperative (Wegner, 2012).

The most popular of the Chi²-based measures of association between two variables within a table is the Cramer’s V. Good norming from 0 to 1 is given by the Cramér's V regardless of the table size, when the row marginal equals the column marginal. The different practical significance interpretation intervals used to interpret the significance of certain research findings captured in the survey are illustrated in Table 4-1 below (Gravetter & Wallnau, 2009). The following interpretation intervals are used for 5 point Likert scale questions: 1.0 - 1.79 very negative, 1.80 - 2.59 negative, 2.6 - 3.5 neutral, 3.41 - 4.20 positive and 4.21 - 5 very positive.
Table 4-1 Practical Significance Interpretation Intervals

Source: Gravetter & Wallnau, 2009

<table>
<thead>
<tr>
<th>Inferential Test: Statistic</th>
<th>Small</th>
<th>Moderate</th>
<th>Large</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-Test: Cohen’s d</td>
<td>$0.2 &lt; d &lt; 0.49$</td>
<td>$0.5 &lt; d &lt; 0.79$</td>
<td>$d &gt; 0.8$</td>
</tr>
<tr>
<td>ANOVA: Eta squared</td>
<td>$\eta^2 &lt; .09$</td>
<td>$.09 &lt; \eta^2 &lt; .25$</td>
<td>$\eta^2 &gt; .25$</td>
</tr>
<tr>
<td>Chi² Test: Cramér’s V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$df^* = 1$</td>
<td>$.10 &lt; V &lt; .30$</td>
<td>$.30 &lt; V &lt; .50$</td>
<td>$V &gt; .50$</td>
</tr>
<tr>
<td>$df^* = 2$</td>
<td>$.07 &lt; V &lt; .21$</td>
<td>$.21 &lt; V &lt; .35$</td>
<td>$V &gt; .35$</td>
</tr>
<tr>
<td>$df^* \geq 3$</td>
<td>$.06 &lt; V &lt; .17$</td>
<td>$.17 &lt; V &lt; .29$</td>
<td>$V &gt; .29$</td>
</tr>
<tr>
<td>Correlation: $r$</td>
<td>$.10 &lt; r &lt; .30$</td>
<td>$.30 &lt; r &lt; .50$</td>
<td>$r &gt; .50$</td>
</tr>
</tbody>
</table>

* $df^* =$ minimum (Rows – 1, Columns – 1)

The comparison between two population means where two samples are paired with each other can be tested by the paired-tailed test, also known as the paired t-test. These samples must be identical and must be subject to different conditions (Shier, 2004). The Chi² tests are based on frequency count data which allows the researcher to compare a set of expected frequencies that describe the null hypothesis to a set of observed frequencies obtained from a random sample. The amount by which the observed frequencies differ from the expected frequencies is measured by the Chi² test. A confidence level of 5% is indicated when the difference is $> 0.05$, the results are statistically significant when the null hypothesis is accepted. A confidence level of 95% is indicated when the difference is $< 0.05$, the results are not statistically significant when the null hypothesis is rejected (Wegner, 2012).

4.8 Reliability and Validity

Reliability and validity are two characteristics by which the credibility of the research findings is measured (Collis & Hussey, 2014). The probability of being able to learn
something from the research study will influence the measurement of reliability and validity. The reliability and validity measurements are also influenced by the probability of drawing statistical significance and the degree to which meaningful conclusions can be drawn from the data analysis (Leedy & Ormrod, 2015). The research study must meet the reliability and validity requirements in order to be deemed as a valuable contribution and consequently accepted into the research community. The differences between reliability and validity are illustrated in Figure 4-5 below.

![Figure 4-5 Reliability and Validity of Data](Source: Shuttleworth, 2009)

The following sub-sections will elaborate on these two aspects individually.

### 4.8.1 Reliability

Reliability refers to the accuracy and precision of measurement and the degree of consistency of the measurement procedure over time (Collis & Hussey, 2014). The research study is believed to be reliable when the same test is repeated in the same environment, and the measurements are free from errors and the same score is assigned to the total population with equal values (Thanasegaran, 2009). In Figure 4.5 the above explanation is illustrated graphically. The importance of reliability tends to be high in positivist studies and of little importance in interpretivism studies (Collis & Hussey, 2014).

The following characteristics need to be met for research studies to be considered as reliable (Cohen; Manion & Morrison, 2011):

- Dependable;
- Trustworthy;
• Consistent;
• Replicable across participants;
• Replicable over time; and
• Replicable with the instrument used.

The reliability of a research study can be tested by a number of tests that are available at the researcher’s disposal. The following tests can be include:

• Stability (Test-Retest Correlation)

The stability test, also known as test-retest correlation, provides an indication of stability over time (Shah, 2009). The stability test is accomplished by completing the test and then-after a retest is done on the same population and within the same time. Correlation coefficients are used to analyse and compare the results of both the tests. High reliability is indicated by a correlation coefficient measurement close to one whilst low reliability is indicated by a measurement close to zero. A weakness of the stability test is that the respondents may recall their answers to previous questions and therefore provide the same response. The evidence of an artificially high reliability can be created by the above mentioned scenario (Collis & Hussey, 2014).

• Equivalence

Different investigators can be utilised to measure the same population, in the same environment but then the equivalence test is involved (Collis & Hussey, 2014). Multiple forms of reliability are known where the researcher is utilising different instruments to measure the same concept (Shah, 2009). The equivalence test will not be affected by the memory effect as in the stability test.

• Homogeneity (Internal Consistency)

Homogeneity, also known as the internal consistency test, involves the calculation of internal consistency by measuring the instrument responses. The measurement of the internal consistency and closeness of the related set of items in a group is done by the Cronbach alpha coefficient. The Cronbach Alpha is a coefficient of reliability and not a statistical test. The following are set intervals for Cronbach Alpha (Collis & Hussey, 2014; Maree, et al., 2012; Nunnally, 1978):

- Cronbach Alpha ≥ 0.90 - high reliability
- Cronbach Alpha ≥ 0.80 - moderate reliability
- Cronbach Alpha ≥ 0.70 - low reliability
- Cronbach Alpha ≤ 0.70 - unacceptable reliability

It is clear from the intervals above that a high coefficient value indicates a high reliability whilst a low coefficient value indicates an unacceptable reliability. For basic or exploratory research, the Cronbach Alpha value of 0.50 and higher is reasoned to be acceptable (Collis & Hussey, 2014; Maree, *et al.*, 2012; Nunnally, 1978).

Internal consistency can be checked by three ways:

a) Split-half correlation

The measurement procedure can be split into two separate instruments which refers to measurement procedure which is then classified as the split-half correlation test. The two instruments are then analysed separately and the correlation for the two sub-scales coefficients is compared to determine if they are highly correlated (Collis & Hussey, 2014; Shah, 2009).

b) Average inter-item correlation

The internal consistency of each question is determined by the average inter-item correlation. The results are for each question on the index. The instruments are then analysed and are considered homogeneous when each question is highly collated (Shah, 2009).

c) Average item-total correlation

The average item-total correlation determines the internal consistency of each question as compared to the total score instrument. This method provides a holistic view of internal consistency of all items (Shah, 2009).

The different ways of establishing reliability are illustrated in Table 4-2. The establishment of any form of reliability requires two or more independent observations on the same sample. The more independent observations that are on a measurement of a concept taken with different points of time or forms, the more freedom there is to establish reliability (Shah, 2009).
### Table 4-2 Types of Reliability

Source: Adapted from Shah, 2009

<table>
<thead>
<tr>
<th>Forms</th>
<th>Multiple</th>
<th>Single</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equivalence</td>
<td>Equivalence</td>
</tr>
<tr>
<td></td>
<td>Stability</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>Stability</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items</th>
<th>Multiple</th>
<th>Single</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Homogeneity</td>
<td>Stability</td>
</tr>
<tr>
<td></td>
<td>Homogeneity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stability</td>
<td></td>
</tr>
</tbody>
</table>

### 4.8.2 Validity

Validity refers to whether the research study truly measures what the researcher wants it to measure and how truthful these results are (Collis & Hussey, 2014). In other words, does the research study hit the bull’s eye of the set research objectives? The consistency requirements for validity are graphically illustrated in Figure 4-5.

The validity assessment strategies can be tested by a number of measurements that are available to the disposal of the researcher. The following are measurements that can be included:

- **Criterion (Pragmatic) Validity**

  Creating a new procedure to measure a construct using a well-established measurement procedure refers to criterion (pragmatic) validity. Quantitative data must be generated using this procedure. The measuring procedure used for criterion validity includes the following: surveys, structured interview etc. Criterion (pragmatic) validity tests can be utilised that are based on different time frames. In research studies done by Lund Research Ltd. (2012), there are two criterion
(pragmatic) validity tests. The following sub-section will elaborate on the two criterion (pragmatic) validity tests:

a) Concurrent Validity

Creating a new procedure to measure a construct using an existing, well-established measurement procedure refers to concurrent validity. The measuring procedure is completed when the two different measurement procedures are performed concurrently.

b) Predictive Validity

Measurement procedures that are used to make accurate predictions and that must be completed according to theory refers to predictive validity.

• Construct Validity

Satisfaction, motivation, ambition and anxiety are phenomena that are not directly observable but they relate to construct validity. It is assumed that these hypothetical constructs exist as factors that explain the observable phenomena. In business research it is vital to use construct validity (Collis & Hussey, 2014).

Convergent validity, discriminant validity and hypothesis-testing are three types of evidence that can be obtained for construct validity which is based on the research problem (Lund Research Ltd., 2012).

• Face Validity

The assurance that a measurement procedure uses, does in fact measure what is intended to be measured refers to face validity. Face validity is also known as logical, surface or appearance validity (Collis & Hussey, 2014). Face validity is the easiest form of validity that can be produced and that is why it is the most common form as well. Face validity is the weakest form of validity as it is based on subjective logic, this means that the researcher will look at the items and agree that the test is a valid measurement procedure, just on the appearance of the results (Lund Research Ltd., 2012; Shah, 2009).

• Content Validity

Content validity is the degree to which the elements within a measurement procedure are representative and relevant of the content that it will be measuring (Lund Research Ltd., 2012). Content validity is permanently led by a judgment
that the content of the measure is representative of the universe of content of the concept being measured (Shah, 2009).

Research studies are required to comply with the validity requirements, this is vital to the validity of the measurement procedure. The correct interpretations must be made by the researcher about the actual study (internal validity) and the results that are generalised to the wider populations (external validity) must also be accurate and correct. The researcher must therefore draw meaningful and strong conclusions about the study as a whole (Persson & Wallin, 2012). Internal- and External validity are two sub-categories to research validity. An explanation of both these categories will be given individually:

- **Internal Validity**

  Research studies that are affected by factors within refer to internal validity. If some major variables (i.e. a design problem) are not controlled, the research instrument (i.e. data collection problem) has problems. Internal validity can be considered when independent variables cause a change in the dependent variable (Berg & Latin, 2008). Eight types of extraneous factors are identified by Campbell and Stanley (1966), that if not controlled can have an effect on internal validity. The eight factors are: history, maturation, testing, instrumentation/task sensitivity, statistical regression, selection, and experimental mortality and selection interactions.

- **External Validity**

  The extent to which the findings can be generalised to the larger population or other environments refers to external validity of the research study. The research study is considered to be externally invalid, when the findings of the research study cannot be applied to the contexts outside the scope of the study (Berg & Latin, 2008). Interaction, pretesting, setting and multiple treatments/interventions are four factors identified by Campbell and Stanley (1966), that adversely affect a research study’s external validity.

The different types of validity and the three particular criteria which differentiate them are illustrated in Table 4-3. The three criteria are; where to start the validation, the evidence and the criteria for establishing validity. Both theory and empirical data must be present during the validity process thus making construct
validity the most demanding validity procedure. The characteristics of construct validity, make it the most valuable in theory construction (Shah, 2009).

Table 4-3 Types of Validity

Source: Adapted from Shah, 2009

<table>
<thead>
<tr>
<th>Validity Types</th>
<th>Where to Start</th>
<th>Evidence</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Judgmental (Pre-Data)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face Validity</td>
<td>Indicator</td>
<td>Judgmental</td>
<td>Measure what is intended to measure</td>
</tr>
<tr>
<td>Content Validity</td>
<td>Concept</td>
<td>Judgmental</td>
<td>Degree to which the elements within a measurement procedure are representative</td>
</tr>
<tr>
<td><strong>Data-Based (Post-Data)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion-Related Validity</td>
<td>Criterion Group</td>
<td>Empirical</td>
<td>Empirical Criterion Prediction</td>
</tr>
<tr>
<td>1. Concurrent</td>
<td>1. Criterion manifesting currently</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Predictive</td>
<td>2. Criterion occurring in the future</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct Validity</td>
<td>Theory</td>
<td>Empirical</td>
<td>Theoretical Criterion Convergent Discriminant Hypothesis-testing</td>
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The three research paradigms will be explained and the identification of the research paradigm utilised in this research study will be defined in the following section.

4.9 Research Paradigms

Researchers use research paradigms to guide them through their research study on how the research should be scientifically conducted. A research paradigm is a
philosophical framework. Positivism (quantitative) and interpretivism (qualitative) are the two paradigms that researchers use. Quantitative research and qualitative research are the two main approaches within the two paradigms (Collis & Hussey, 2014; Morgan & Smircich, 1980; Yilmaz, 2013).

4.9.1 Quantitative Research

Research that is conducted in natural science and the social sciences refers to quantitative research (Collis & Hussey, 2014). Numerical data are analysed by means of mathematical equations, such as statistics (Yilmaz, 2013). Objective evidence can be scientifically verified by utilising quantitative approaches. Data derived from quantitative research relies on a deductive reasoning process to interpret and structure the meaning for the outcome. A quantitative approach endorses the view that believed that the social and psychological phenomena have an objective reality external to the studied subjects (Collis & Hussey, 2014; Yilmaz, 2013). The researcher should have an outsider view to the research process and there should also be distance between what is researched and the researcher (Mason, 2002). In quantitative research it is important to maintain an independent and objective stance towards the static reality.

4.9.2 Qualitative Research

Qualitative data and quantitative data are opposites of each other. The findings are derived from other means than from statistical procedures (Yilmaz, 2013). The data derived from qualitative research relies on an inductive reasoning process to interpret and structure the meaning for the outcome. Human perception is believed to shape and be subjective to the social reality of the qualitative approach (Collis & Hussey, 2014). The relationship of the researcher with the studied subject is close and empathetic. The researcher is seen as having an ‘insider view’ towards the research study (Creswell, 2007; Mason, 2002). Research problems are studied by qualitative researchers by investigating the interpretations, understandings, perceptions, and meanings of individuals or groups ascribe to a social or human problem (Creswell, 2007; Mason, 2002). An emerging qualitative research approach is then used to collect the data in a natural setting that is sensitive to the data subject being studied (Creswell, 2007). Qualitative research therefore tries to understand how a social experience is created and given meaning, which stems from the inextricably connected relationship between the knower and the known (Yilmaz, 2013). The data
that is collected by qualitative research studies are seen as the primary source of data (Collis & Hussey, 2014).

4.9.3 Mixed Methods

Researchers can combine quantitative and qualitative research techniques, methods, concepts, languages or approaches into a single study method that refers to a mixed method. Collecting research data in this manner will allow different strategies to be followed and the researcher will build on the strengths of the selected methods strengths, discarding their weaknesses and offsetting certain method biases. Potential complexity is created by utilising mixed methods and therefore it allows for increased value (Harwell, 2011).

4.9.4 Research Paradigm for this Study

The research study uses the mixed method approach. The researcher’s aim is to gain insight into the knowledge and experience of the individuals in the given research issue. The research problem needs to be better understood by the researcher after collecting the relevant data. Collection of the data will assist the researcher in interpreting and structuring the meanings that are derived from the data. The findings of the numeric data will be generalised to the greater population after collecting the data in a systematic and objective manner from the selected sample.

4.10 Cross-Sectional Studies

The Research Onion focuses, in the fourth layer, on the research time horizons. The following sub-sections will define Cross-Sectional Studies, explain what the purpose of Cross-Sectional Studies is and then cover the use of Cross-Sectional Studies for this study.

4.10.1 Cross-Sectional Studies Defined

Cross-Sectional Studies, also known as prevalence studies are when findings are measured by researchers across sections of a population at approximately the same time (single time point) or over a short period. A wide sample is utilised when researchers measure their study. The sample includes people of different ages, different income levels, different religions, different educational levels, etc. Comparisons are made from the different captured variables that are provided by a
‘snapshot’ of the particular situation at the approximate timeframe. In a cross-sectional study, the data are recorded without the interference or manipulation of the subject or its environment from the researcher. Observation by the researcher in a Cross-Sectional Study plays an important role (Bailey, 1994; Hair; Celsi; Money; Samouel & Page, 2011; Monsen & Van Horn, 2008).

4.10.2 Purpose of Cross-Sectional Studies

The research study used Cross-Sectional Studies, which are mostly used in theory by research studies. The aim of Cross-Sectional Studies is to describe a population with respect to the commonness of the captured variables of specific interest at approximately the same time or over a short period (Levin, 2006).

4.10.3 Cross-Sectional Studies for this Study

As previously discussed, a questionnaire was compiled and distributed amongst dairy farmers which was used to determine the information that dairy farmers require to make the right decisions. Therefore, a cross-sectional study will be used to compare the two different population groups, these being dairy farmers on a pasture system and dairy farmers on a total mixed ration (TMR) system, at a single point in time. The researcher will compare many different variables at the same time and draw conclusions as required.

4.11 Summary

Chapter 4 addressed RQ6 which states; “What research methodology can be used to understand the information required by dairy farmers?” The chapter completed the RO6 which states; “Establish a research methodology that will provide clarity on what information service dairy farmers require.” Current research methodology practices were reviewed and the suitable research methodologies as applicable to this research study were extracted and presented.

Chapter 4 highlighted the research design with reference to the Research Onion. Thereafter, the chapter continued to discuss what is meant by research and then acknowledge the two research paradigms. The research paradigm selected for this study is a mixed-method approach. Furthermore, the survey designs, survey respondents and data collection and analysis methods used were discussed. The statistical methods used in this study were then discussed followed by cross-sectional
studies and how they relate to this study. Chapter 4 concluded with a discussion on the reliability and validity of this research study.

Chapter 5 will identify and propose a communications framework for dairy farmers using Information as a Service. Therefore, the research objective of for Chapter 5 would be focused on RO7, which states; “Propose a communications framework, using Information as a Service, for dairy farmers.”. The research objective will be achieved by asking RQ7, which states; “What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?”. 
5.1 Introduction

Chapter 4 presented the research design with reference to the research onion. The research onion presented a layered approached which was used to describe the research philosophy, research approaches, research strategies, time horizons and techniques and procedures in general and with reference to this research study. The chapter concluded by summarising the followed research methodology followed in this treatise.

Chapter 5 will address RQ7 which states; “What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?” The objective of this chapter is to propose a communications framework, using Information as a Service, for dairy farmers. A suitable answer to the identified research question was found by reviewing current literature studies. From these findings an IaaSDFS was compiled and distributed to dairy farmers in South Africa. The IaaSDFS focused on determining what information is required by dairy farmers in order to make decisions that are required in their farming operations in a timeous, relevant and personalised manner. The findings will be presented in this chapter. An overview of the RQs and ROs of Chapter 5 is presented in Figure 5-1.

Chapter 5 will provide a comprehensive analysis of the collected empirical data. The analysis will be compiled by analysing each research question and presenting the findings in a clear and logical manner. Chapter 5 will conclude with a proposed communications framework for dairy farmers using Information as a Service. A Structural Overview of Chapter 5 is presented in Figure 5-2. The following section will elaborate on the analysis of the data collected by the IaaSDFS.
Figure 5-1 Chapter 5 Research Questions and Research Objectives
Analysis of Empirical Results

The respondents who participated in this study were all dairy farmers in South Africa. The respondents were asked to answer a survey that was either sent by email or completed by the researcher or his colleagues in consultation with the respondents. The information gathered is to identify what information is required by dairy farmers in order to make the right decisions on their farms. Therefore, the areas covered in the IaaSDFS included general Farming Practice questions, the importance of information for dairy farmers, information on agricultural organisations, a dairy farmer’s usage of and connection to the Internet, usage of mobile devices by dairy farmers, usage of Apps by dairy farmers and the general information required by them. These findings provide a holistic view of the information required by dairy farmers in order to make the correct decisions on farming practices.

5.2.1 IaaSDFS Response Rate

The IaaSDFS was distributed via the Milk Producers Organisation (MPO) which contained a hyperlink to the online survey to 325 dairy farmers throughout South Africa. The researcher was not in control of the distribution therefore the number of undelivered emails is unknown. A total of 5 responses was received through the distribution channel of the MPO. The remaining 91 responses were collected by distributing the survey via Email directly to the dairy farmers who completed the survey in the presence of the researcher or his colleagues. It should be acknowledged that the IaaSDFS are focused on the respondent’s primary capacity as a dairy farmer. The
results of the captured responses obtained by the 2 methods, namely, online vs manual capturing are presented in Figure 5-3.

![Online vs Manual](image)

Figure 5-3 Online vs Manual

Figure 5-3 depicts the responses received 100 percent (n = 96) that were captured by using two methods, namely an Online Web Survey that ran through the website of the NMMU. The second method was responses captured manually for the questionnaires that were completed in the presence of the respondent.

Thirty seven respondents answered the survey online and fifty nine respondents completed the survey in the presence of the researcher or his colleagues. The majority of the surveys were filled out in the presence of the researcher.

5.2.2 IaaSDFS

The IaaSDFS used for this study consisted of ten data-gathering sections. See Appendix D – IaaSDFS. These are:

- Section 1: Biographical Details
- Section 2: Farming Practices
- Section 3: Importance of information to dairy farmers
- Section 4: Information: Agricultural Organisations
- Section 5: Customer Satisfaction – De Heus
- Section 6: Internet Usage
- Section 7: Mobile Device Usage
Section 1: Biographical Details was used to collect the respondents’ biographical details which were used to understand the representation and distribution of the participants.

Section 2: Farming Practices was used to determine the kind of farming operations that the dairy farmers utilise on their farms. The design of the questions was based on Multiple Choice (fact) with the option of more than one answer per question.

Section 3: Importance of Information to dairy farmers was used to collect information regarding information that dairy farmers might regard as important for their farming operations. The design of the questions was based on the Likert Scale (1–5).

Section 4: Agricultural Organisations Information was used to assess the respondents’ personal satisfaction level with agricultural organisations. The design of the questions was based on the Likert Scale (1–5).

Section 5: Customer Satisfaction – De Heus was used to assess the respondents’ personal satisfaction level with De Heus. The question’s design was based on the Likert Scale (1–5).

Section 6: Internet Usage was used to collect the respondents’ general utilisation of the Internet. The design assess was based on Multiple Choice.

Section 7: Mobile Device Usage was used to collect the respondents’ general use of their mobile devices. The design of the questions was based on Multiple Choice.

Section 8: Application (Apps) Usage was used to collect the respondents’ general utilisation of Apps. The design of the questions was based on Multiple Choice.

Section 9: Dairy Farmers Information Required was used to collect information from the respondents’ on the types of markets that they research. The design of the questions was based on Multiple Choice.

Section 10: Personal Details was used to collect the personal details of the respondents in the event that they would like feedback from the results of the research study. The criteria used were the following: Name, Telephone Number and Email
address. The following sub-section will elaborate on the findings for Section 1: Biographical Details.

5.2.2.1 Section 1: Biographical Details

The IaaSDFS collected biographical information on the respondents which was used to understand the representation and distribution of the participants.

The section included the following fields:

- Age;
- Gender;
- Language; and
- Province.

The questions were answered by means of Multiple Choice. See Appendix D for detailed descriptions of the IaaSDFS’s Demographic Information.

Figure 5-4 Age

Figure 5-4 depicts the responses received 100 percent (n = 96) for the question; “What is your age?”. The respondents in the age group 35 or younger contributed 27 percent (n = 26), those in the age group 36 to 55 contributed 52 percent (n = 50) and those who indicated that they were in the age group of over 55 contributed 21 percent (n = 20) to the total.

The majority 52 percent (n = 50) of the respondents are therefore in the age group between 36 and 55 years of age. The age categories younger and older than the age
category mentioned have almost an equal number of respondents who participated in the survey. The percentages of the respondents in the different age categories are well balanced over the age spectrum. The results from research done by Simpson and Calitz, 2014, indicated that 19 percent of the respondents were younger than 35 years of age, 66 percent of the respondents were between 35 and 55 years old and 15 percent over the age group of 65 years old. The results from this research study done with dairy farmers compares well with the results received from the work done by Simpson and Calitz, 2014.

Figure 5-5 Gender

Figure 5-5 depicts the responses received 100 percent (n = 96) for the question; “Gender.”. The respondents who participated indicated that 96 percent were male (n = 92) and that 4 percent were female (n = 4).

The majority 96 percent (n = 92) of the respondents, therefore, who participated in this research survey are males. The results on gender are expected to be more in favour of males, because in agriculture the majority of the farm owners are male. The results from research done by Simpson and Calitz, 2014, indicted that 82 percent of the respondents were male and 18 percent of the respondents were female. The results from this research study done with dairy farmers compares well with the work done by Simpson and Calitz, 2014.
Figure 5-6 Language

Figure 5-6 depicts the responses received 100 percent (n = 96) for the question; “Language.” The respondents who participated indicated that 81 percent speak Afrikaans (n = 78) and that 19 percent of the respondents indicated that they speak English.

In South Africa we have eleven official languages, but only Afrikaans and English respondents participated in the survey. The majority 81 percent (n = 78) of the respondents indicated that they speak Afrikaans instead of English. The results from research done by Simpson and Calitz, 2014, indicated that 87 percent of the respondents were Afrikaans speaking. The results from this research study done with dairy farmers compares well with the work done by Simpson and Calitz, 2014.
Figure 5-7 Provinces

Figure 5-7 depicts the responses received 100 percent (n = 96) for the question; “What province do you live in?”. The respondents who participated indicated that 52 percent (n = 50) live in the Eastern Cape Province, 6 percent (n = 6) indicated that they live in the Free State Province, 22 percent (n = 21) indicated that they live in the Western Cape Province, 13 percent (n = 12) indicated that they live in the North West Province, 2 percent (n = 2) indicated that they live in the Northern Cape Province and 5 percent (n = 5) indicated that they live in KwaZulu-Natal Province. The findings produced Chi² = 0.80 which stems from d.f. = 1 and n = 95, p = 0.370 which indicates that there is no significant difference between the Eastern Cape province and the other provinces with regard to the importance of information.

The findings produced Chi² = 8.62 which stems from d.f. = 1 and n = 95, p = 0.03 which indicates that a larger proportion of the Eastern Cape farmers compared positively with the other provinces. The variance = 0.30 indicates that there is a medium variation from the mean and individual numbers to each other within the data set. Consequently the findings produced Chi² = 0.80 which stems from d.f. = 1 and n = 95, p = 0.370 which indicates that there is no significant difference between the Eastern Cape province and the other provinces with regard to customer satisfaction levels for dairy farmers with De Heus. The findings produced Chi² = 0.80 which stems from d.f. = 1 and n = 95, p = 0.370 which indicates that there is no significant difference between
the Eastern Cape province and the other provinces with regard to customer satisfaction levels for dairy farmers with De Heus.

In South Africa we have nine official provinces, but dairy farming is not a major farming enterprise in all nine of the provinces. The majority 52 percent (n = 50) of the respondents indicated that they lived in the Eastern Cape Province. The Eastern Cape Province is regarded as the “Milk Mecca” of South Africa. The Eastern Cape Province in South Africa has the most dairy cows that are been milked. Companies need to focus their attention in the Eastern Cape, because this province is the leading province regarding dairying in South Africa. The Eastern Cape Province has the majority of respondents in the research study, because the researcher resides in the Eastern Cape Province, therefore more attention was paid to this province. The results from research done by Simpson and Calitz, 2014, indicated that 24 percent lived in the Free State, accounted for most respondents followed by 16 percent that lived in the Northern Cape, 15 percent that lived in the Western Cape, 12 percent that lived in the Eastern Cape, 11 percent that lived in Mpumalanga, 10 percent lived in the North West and the rest of the South African provinces in smaller numbers.

The results from this research study do differ compared to the results of work done by Simpson and Calitz, 2014. The results from this research study done with dairy farmers will differ compared to the results from Simpson and Calitz, 2014, because the regions where milk is produced is in different region that where grain is produced.

5.2.2.2 Summary of Findings in Section 1

In Section 1, the information collected by the IaaSDFS focussed on the biographical details of the responding dairy farmers who participated in the surveys. The majority 52 percent (n = 50) of the respondents were in the 36 to 55 age group. The results of this research study compares well with studies done by Simpson and Calitz, 2014, where 19 percent of the respondents were in the age younger than 35 years old, 66 percent were in the age group between 35 and 55 years old and 15 percent were over the age of 65 years old.

The majority of the respondents were male, which is normal, because farming is a male orientated career. The results compare well with results from studies done by
Simpson and Calitz, 2014, were 82 percent of the respondents were male and 18 percent were female.

The majority of the respondents were Afrikaans speaking, which may differ if other farming enterprises were surveyed. The results compare well with results from studies done by Simpson and Calitz, 2014, were 87 percent of the respondents were Afrikaans speaking.

The majority of the respondent’s farm in the Eastern Cape Province, which received greater attention as the researcher resides in the Eastern Cape Province. The results from research done by Simpson and Calitz, 2014, do differ from the research done in this study with dairy farmers, because milk is produced in different regions than the traditional grain regions.

The researcher needed to understand the farming practices that dairy farmers are using on their farms. Therefore, questions about the different farming practices on a dairy farm had to be answered. The following sub-section will elaborate on the findings for Section 2: Farming Practices.

5.2.2.3 Section 2: Farming Practices

In Section 2, the IaaSDFS collected information on the different farming practices that dairy farmers utilise. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Breeds of dairy cattle;
- Types of farming systems;
- Methods used to feed concentrates;
- Crops planted;
- Crops planted for silage;
- Dairy parlours utilised;
- Size of a dairy herd;
- Method of milking dairy cows; and
- Technology used by dairy farmers.

The questions were answered by means of Multiple Choice questions. The majority of the questions in Section 2 were of the nature where respondents could select more than one answer.
Figure 5-8 depicts the responses received 98 percent (n = 94) for the question; “What breed of cow do you farm with?”. The Mean for the question is $m = 1.54$ and the Standard Deviation is 0.90. The respondents who participated indicated that 54 percent (n = 51) farm with Friesland cows, 48 percent (n = 45) indicated that they farm with Jersey cows, 4 percent (n = 4) indicated that they farm with Ayrshire cows, 4 percent (n = 4) indicated that they farm with Brown Swiss cows, 38 percent (n = 36) indicated that they farm with Cross Bred cows and 5 percent (n = 5) indicated that they farm with other types of cows.

The majority 54 percent (n = 51) of the respondents are farming with Friesland cows. Jersey cows and Cross Bred cows are also cows that the respondents prefer to farm with. In the dairy industry there are five main dairy cattle breeds that dairy farmers farm with, namely, Friesland-, Jersey-, Ayrshire-, Guernsey- and Brown Swiss cows. The gene pool of the Friesland- and Jersey cows is the largest of all the dairy breeds, therefore dairy farmers tend to prefer to farm mainly with these two breeds. The breed of cow that are milked in certain areas of South Africa will in general dictate the kind of dairy factory that are needed in the area.
Figure 5-9 Types of Farming Systems

Figure 5-9 depicts the responses received 98 percent \( (n = 94) \) for the question; “What farming system do you use?”. The Mean for the question is \( m = 1.23 \) and the Standard Deviation is 0.23. The respondents who participated indicated that 70 percent \( (n = 66) \) are utilising a pasture system, 12 percent \( (n = 11) \) indicated that they are utilising a Partial Mixed Ration (PMR) system and 21 percent \( (n = 20) \) indicated that they are utilising a Total Mixed Ration (TMR) system. The findings produced \( \chi^2 = 28.11 \) which stems from \( \text{d.f.} = 1 \) and \( n = 94 \), \( p < 0.0005 \) which indicates that a larger proportion of the Eastern Cape are positively compared with the farming systems. The variance = 0.55 indicates that there is a large deviation from the mean and consequently the individuals deviate widely from each other in the data set.

The findings produced \( \chi^2 = 1.32 \) which stems from \( \text{d.f.} = 1 \) and \( n = 94 \), \( p = 0.251 \) which indicates that there is no significant difference between the farming systems and each system, therefore the information about them is of equal importance to dairy farmers. The findings produced \( \chi^2 = 1.27 \) which stem from \( \text{d.f.} = 1 \) and \( n = 93 \), \( p = 0.260 \) which indicates that there is no significant difference between the farming systems and the information on agricultural organisations for dairy farmers. The findings produced \( \chi^2 = 0.43 \) which stem from \( \text{d.f.} = 1 \) and \( n = 47 \), \( p = 0.551 \) which indicates that there is no significant difference between the farming systems and the customer satisfaction levels for dairy farmers with De Heus.
The majority 70 percent (n = 66) of the respondents indicated that they are utilising a pasture system. A Pasture system is a cheaper system that dairy farmers can produce milk from. Pasture systems are normally utilised in the higher rainfall areas of South Africa where the growth of pasture is maintained by rainfall and irrigation. The areas included in South Africa are KwaZulu-Natal Province and the Eastern Cape Province as shown in Figure 5-7. TMR systems are mainly utilised in dryer areas of South Africa such as the Free State Province, North West Province, Northern Cape Province and the Western Cape Province as shown in Figure 5-7.

Figure 5-10 Ways of Feeding Concentrates

Figure 5-10 depicts the responses received 97 percent (n = 93) for the question; “How do you feed concentrates to your cows?”. The respondents who participated indicated that 75 percent (n = 70) feed concentrates in the parlour, 13 percent (n = 12) indicated that they feed concentrates in a post-feeding unit and 12 percent (n = 11) indicated that they feed concentrates utilising other methods.

The majority 75 percent (n = 70) of the respondents indicated that they use a feeding method of feeding concentrates in the parlour. Feeding concentrates in the parlour is the most popular way of feeding cows, because the cows are then normally less stressed. Post-feeding units were used in older parlours where cows used to receive their concentrates after they had been milked.
Figure 5-11 Planted Crops

Figure 5-11 depicts the responses received 100 percent (n = 96) for the question; “Which of the following do you plant?”. The Mean for the question is m = 2.76 and the Standard Deviation is 1.55. The respondents who participated indicated that 76 percent (n = 73) planted Rye Grass, 43 percent (n = 41) indicated that they planted Kikuyu, 44 percent (n = 42) indicated that they planted Oats, 56 percent (n = 54) indicated that they planted Maize, 4 percent (n = 4) indicated that they planted Wheat, 32 percent (n = 31) indicated that they planted Sorghum and 21 percent (n = 20) indicated that they planted other types of crops.

The majority 76 percent (n = 73) of the respondents planted Rye Grass. The crop is mainly utilised in the areas of South Africa where farmers use a pasture system, as discussed under Figure 5-9. The crops mentioned in Figure 5-11 can either be planted for the purpose of grazing or used in systems where silage is made and fed to the dairy cows. Silage is mostly fed to cows in TMR Systems or to dry stock on a pasture system.
Figure 5-12 Crops Planted for Silage

Figure 5-12 depicts the responses received 97 percent (n = 93) for the question; “Which of the following do you plant to make silage?”. The Mean for the question is $m = 2.01$ and the Standard Deviation is $1.10$. The respondents who participated indicated that 42 percent (n = 39) planted Rye Grass, 17 percent (n = 16) indicated that they planted Kikuyu, 23 percent (n = 21) indicated that they planted Oats, 71 percent (n = 66) indicated that they planted Maize, 5 percent (n = 5) indicated that they planted Wheat, 28 percent (n = 26) indicated that they planted Sorghum and 15 percent (n = 14) indicated that they planted other types of crops to make silage.

The majority 71 percent (n = 66) of the respondents planted Maize. The crop is mainly used as silage to feed dairy cattle during dry periods in South Africa and where dry stock need more feed to maintain their condition. The crops used for the production of silage are also mainly used in TMR systems, as mentioned in Figure 5-9.
Figure 5-13 Dairy Parlours used by Dairy Farmers

Figure 5-13 depicts the responses received 100 percent \((n = 96)\) for the question; “What kind of dairy parlour do you milk in?”. The Mean for the question is \(m = 8.55\) and the Standard Deviation is 2.07. The respondents who participated indicated that 75 percent \((n = 72)\) milk their dairy cows in a Herringbone parlour, 21 percent \((n = 20)\) indicated that they milk their dairy cows in a Rotary parlour and 4 percent \((n = 4)\) indicated that they milk their dairy cows in other types of dairy parlours.

The majority 75 percent \((n = 72)\) of the respondents indicated that they milk their dairy cows in a Herringbone parlour. The type of dairy parlour that is used to milk dairy cows in will mainly depend on the size of the dairy herd. Rotary dairy parlours are used where larger dairy herds need to be milked. The Herringbone parlour is a cheaper system to maintain, therefore more respondents use a Herringbone parlour.
Figure 5-14 Size of Dairy Herd

Figure 5-14 depicts the responses received 98 percent (n = 94) for the question; “How many cows are you milking?”. The respondents who participated indicated that 9 percent (n = 8) milk 0 – 99 cows, 12 percent (n = 11) indicated that they milk 100 – 199 cows, 35 percent (n = 33) indicated that they milk 200 – 499 cows and 45 percent (n = 42) indicated that they milk more than 500 cows.

The majority 45 percent (n = 42) of the respondents milk more than 500 cows. The size of the dairy herd plays a major role in the economic figures of a dairy farm. Cow number will play a role in the decisions that companies make in regards to where new factories will be built. The larger dairy herds are mainly milked in the pasture-based systems such as in the Eastern Cape Province and in KwaZulu-Natal Province as discussed in Figure 5-7.
Figure 5-15 Method of Milking Dairy Cows

Figure 5-15 depicts the responses received 98 percent (n = 94) for the question; “What method do you use to milk your cows?”. The respondents who participated indicated that 15 percent (n = 14) milk their dairy cows manually (by hand) and 85 percent (n = 80) indicated that they milk their dairy cows automatically.

The majority 85 percent (n = 80) of the respondents milk their dairy cows automatically. Dairy cows are milked by using a milking machine but there are countries abroad that do make use of robots to milk their dairy cows. In South Africa a robot system is still too expensive, because of import tariffs that are charged on these systems.

Figure 5-16 Technology used by Dairy Farmers
Figure 5-16 depicts the responses received 94 percent (n = 90) for the question; “Which of the following technologies is your dairy parlour equipped with?”. The Mean for the question is \( m = 1.41 \) and the Standard Deviation is 0.49. The respondents who participated indicated that 44 percent (n = 40) use Automatic Cluster Removers, 27 percent (n = 24) indicated that they use an Alpro System, 28 percent (n = 25) indicated that they use an Afimilk System, 8 percent (n = 7) indicated that they use a Milkfriend system, 13 percent (n = 12) indicated that they use other types of technology in their dairy parlour and 21 percent (n = 19) indicated that they do not use any technology in their dairy parlour.

The majority 44 percent (n = 40) of the respondents use Automatic Cluster Removers. The technology mentioned above is mainly used to manage feeding programmes for dairy cows in the parlour. The technology is also used as a tool to measure the milk production of the cows on a daily basis. The information gathered is used by dairy farmers in order to help them with their planning of their dairy enterprise.

5.2.2.4 Summary of Findings in Section 2

In Section 2, the information collected by the IaaSDFS focussed on the farming practices of the respondents who participated as dairy farmers in the surveys. The majority of the respondents indicated that they milk Friesland, Jersey and Cross Bred cows. The majority 70 percent (n = 66) of the respondents indicated that they use a pasture system. The pasture system is a cheaper way of milking dairy cows and that is why this system is more popular than the TMR system. The province in which the respondents are operating will, to a large degree, determine whether the respondent will use a pasture or TMR system. Production systems in SA differ from region to region (Lassen, 2012). Where there is enough water (Eastern Cape) there are grass based systems similar to New Zealand or Ireland (Lassen, 2012). The majority 75 percent (n = 70) of the respondents feed their dairy cows in the parlour. The majority 76 percent (n = 73) of the respondents plant Rye grass for the cows to graze. The respondents who are milking their cows on a TMR system will not graze any type of pasture. The majority 71 percent (n = 66) of the respondents planted maize for making silage. The respondents who are milking their cows in a TMR system
will plant more maize as silage than the respondents milking their cows on a pasture system. The ration consists of maize or other silage and alfalfa (Lassen, 2012).

The majority 75 percent (n = 72) of the respondents milk their cows in a Herringbone parlour. The majority 45 percent (n = 42) of the respondents milk more than 500 cows on their farms. Largest herds are kept in the Eastern Cape. Farmers farm on average about 500 cows there (Lassen, 2012). The majority of the respondents milk their cows with a milking machines. The number of cows that are milked on a dairy farm makes it impossible to milk them by hand. The majority of the respondents use technology in the form of programs or equipment to milk their cows.

The researcher needed to understand the importance of information that dairy farmers require on their dairy farms. Therefore, questions on the importance of information required by dairy farmers had to be answered. The following sub-section will elaborate on the findings for Section 3: Importance of Information to dairy farmers.

5.2.2.5 Section 3: Importance of Information to Dairy Farmers

In Section 3, the IaaSDFS collected information on the importance of information that dairy farmers require in their decision-making process. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Importance of the Weather Forecast;
- Importance of the Planting Date of Maize as Silage;
- Importance of Seed Cultivars;
- Importance of Planting Dates for Certain Pastures;
- Importance of the Correct Utilisation and Management of Pastures;
- Importance of Information on Total Mixed Ration (TMR) Systems;
- Information of Herd Health;
- Importance of Correct Feeding for Calves;
- Guidelines on Feeding the Dairy Cow; and
- Information on Important Dates in the District.

The questions were answered by means of a Likert Scale, where 1 indicated that the respondents thought that the statement was Not Important and 5 indicated that the respondents thought that the statement was Very Important. The Cronbach Alpha
coefficient for Section 3 produced a value of 0.72, this means that Section 3 has a good reliability. The findings produced a t-test of 15.53 and p < 0.0005, which indicates that a statistical, significant relationship exists between the variables. The findings produced $\chi^2 = 0.80$ which stems from d.f. = 1 and n = 95, p = 0.370 which indicates that there is no significant difference between the Eastern Cape province and the other provinces with regard to the importance of information. The findings produced $\chi^2 = 1.32$ which stems from d.f. = 1 and n = 94, p = 0.251 which indicates that there is no significant difference between the farming systems and the importance of information for dairy farmers.

![Importance of Weather Forecast](image)

**Figure 5-17 Importance of Weather Forecast**

Figure 5-17 depicts the responses received 99 percent (n = 95) for the question; “Weather Forecast?”. The Mean for the question is $m = 4.59$ and the Standard Deviation is 0.71. The respondents who participated indicated that 2 percent (n = 2) agreed that the statement was at a level 2 out of 5, 6 percent (n = 6) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 22 percent (n = 21) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 69 percent (n = 66) of the respondents agreed that the statement was very important.

The majority 91 percent (n = 87) of the respondents agreed with the statement that the Weather Forecast is very important for them in their decision making process. The Weather Forecast can be utilised by dairy farmers in order to decide, for example,
when to plant certain crops. The Weather Forecast can therefore be part of the information that organisations can share with their customers on the organisations’ website.

Figure 5-18 Importance of Planting Date for Maize as Silage

Figure 5-18 depicts the responses received 99 percent (n = 95) for the question; “Planting date for maize as silage?”. The Mean for the question is $m = 3.99$ and the Standard Deviation is 1.36. The respondents who participated indicated that 13 percent (n = 12) agreed that the statement was at a level 1 out of 5, 2 percent (n = 2) agreed that the statement was at a level 2 out of 5, 9 percent (n = 9) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 25 percent (n = 24) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 51 percent (n = 48) of the respondents agreed that the statement was very important.

The majority 76 percent (n = 72) of the respondents agreed with the statement that the planting date of maize as Silage is very important for them in their decision making process. The planting date of maize as silage can be utilised by dairy farmers in order to plan, for example, when to plant their maize for the making of maize silage. The planting date for maize silage is important, because the date will determine on which date the maize will be ready for the siling process.
Figure 5-19 Importance of Seed Cultivars

Figure 5-19 depicts the responses received 99 percent (n = 95) for the question; “Information on seed cultivars (pasture or commercial crops)?”. The Mean for the question is $m = 4.34$ and the Standard Deviation is 0.94. The respondents who participated indicated that 2 percent (n = 2) agreed that the statement was at a level 1 out of 5, 3 percent (n = 3) agreed that the statement was at a level 2 out of 5, 11 percent (n = 10) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 27 percent (n = 26) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 57 percent (n = 54) of the respondents agreed that the statement was very important.

The majority 84 percent (n = 80) of the respondents agreed with the statement that seed cultivars are very important to them in their decision-making process. The seed cultivars can be utilised by dairy farmers in order to plan which seed cultivars to use when they are planting crops. Seed cultivars normally act differently from each other depending on how they were bred. The seed cultivars can, for example, germinate at different temperatures.
Figure 5-20 Importance of Planting Dates for Certain Pastures

Figure 5-20 depicts the responses received 99 percent (n = 95) for the question; “Information on planting dates for certain pastures?”. The Mean for the question is \( m = 4.04 \) and the Standard Deviation is 1.17. The respondents who participated indicated that 7 percent (n = 7) agreed that the statement was at a level 1 out of 5, 1 percent (n = 1) agreed that the statement was at a level 2 out of 5, 18 percent (n = 17) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 27 percent (n = 26) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 46 percent (n = 44) of the respondents agreed that the statement was very important.

The majority 73 percent (n = 70) of the respondents agreed with the statement that planting dates for certain pastures are very important to them in their decision-making process. The planting date of certain pastures plays a very important role for certain pastures, because it will determine whether the pasture can be grazed by dairy cows in time. Therefore, dairy farmers can utilise this information when they are planning to plant pasture on their farms.
Figure 5-21 Importance of the Correct Utilisation and Management of Pastures

Figure 5-21 depicts the responses received 99 percent (n = 95) for the question; “Information on the correct utilisation and management of pastures?”. The Mean for the question is $m = 4.27$ and the Standard Deviation is 1.17. The respondents who participated indicated that 7 percent (n = 7) agreed that the statement was at a level 1 out of 5, 2 percent (n = 2) agreed that the statement was at a level 2 out of 5, 7 percent (n = 7) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 22 percent (n = 21) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 61 percent (n = 58) of the respondents agreed that the statement was very important.

The majority 83 percent (n = 79) of the respondents agreed with the statement that the correct utilisation and management of pastures is very important to them in their decision-making process. The correct utilisation and management of pastures plays a very important role for better yields from pastures and better milk production from cows. Therefore, dairy farmers can utilise information on the correct utilisation and management of pastures in order to produce good quality milk and pastures. The majority agreed that the statement was very important, because as shown in Figure 5-9 the majority of the respondents produce milk from pastures. The dairy farmers milking on a TMR system would not agree that the statement is very important to them. Dairy farmers milking from a TMR system would regard information on silage as very important.
Figure 5-22 Importance of Information on Total Mixed Ration Systems (TMR)

Figure 5-22 depicts the responses received 99 percent (n = 95) for the question; “Information on Total Mixed Ration (TMR) Systems?”. The Mean for the question is m = 3.21 and the Standard Deviation is 1.54. The respondents who participated indicated that 21 percent (n = 20) agreed that the statement was at a level 1 out of 5, 13 percent (n = 12) agreed that the statement was at a level 2 out of 5, 23 percent (n = 22) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 11 percent (n = 10) of the respondents indicated that they agreed that the statement was at a level 4 out of 5, and 33 percent (n = 31) of the respondents agreed that the statement was very important.

The majority 33 percent (n = 31) of the respondents agreed with the statement that Information on TMR systems is very important to them in their decision-making process. The TMR systems will be more important to dairy farmers producing milk by using a TMR system as seen in Figure 5-9. The dairy farmers milking on a pasture system will regard the information about a TMR system of very low importance as shown in Figure 5-9. Therefore, dairy farmers producing milk by using a TMR system can utilise this information in order to produce good quality milk on a TMR system.
Figure 5-23 Importance of Information on Herd Health

Figure 5-23 depicts the responses received 99 percent (n = 95) for the question; “Information on herd health?”. The Mean for the question is $m = 4.68$ and the Standard Deviation is 0.61. The respondents who participated indicated that 0 percent (n = 0) agreed that the statement was at a level 1 out of 5, 1 percent (n = 1) agreed that the statement was at a level 2 out of 5, 4 percent (n = 4) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 20 percent (n = 19) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 75 percent (n = 71) of the respondents agreed that the statement was very important.

The majority 95 percent (n = 90) of the respondents agreed with the statement that information on herd health is very important to them with regard to their farming operations. Dairy farmers, in general, need the correct information on herd health regardless of the system used to produce milk from cows. Herd health is a core aspect of dairy farming in order to produce good quality milk from healthy cows. In Section 3.3.1, information on herd health is shown from literature to be of high importance in dairy farming (Morton, 2007).
Figure 5-24 Importance of Information on the Correct Feeding for Calves

Figure 5-24 depicts the responses received 99 percent (n = 95) for the question; “Information on the correct feeding for calves?”. The Mean for the question is $m = 4.73$ and the Standard Deviation is 0.51. The respondents who participated indicated that 0 percent (n = 0) agreed that the statement was at a level 1 out of 5, 0 percent (n = 0) agreed that the statement was at a level 2 out of 5, 3 percent (n = 3) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 21 percent (n = 20) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 76 percent (n = 72) of the respondents agreed that the statement was very important.

The majority 97 percent (n = 92) of the respondents agreed with the statement that information on the correct feeding for calves is very important to them with regard to their farming operations. The calves on a dairy farm are the future cows that will be milked in the dairy. Therefore, it is important for dairy farmers to feed their calves correctly. Calves that are fed well on a dairy farm will in the end produce good quality milk. In Section 3.3.3, information on nutrition is shown from literature to be of great importance in dairy farming (Morton, 2007; Milk SA, 2014; Herdt, 2014).
Figure 5-25 Importance of Guidelines on Feeding the Dairy Cow

Figure 5-25 depicts the responses received 99 percent (n = 95) for the question; “Guidelines on feeding the dairy cow?”. The Mean for the question is $m = 4.64$ and the Standard Deviation is 0.58. The respondents who participated indicated that 0 percent (n = 0) agreed that the statement was at a level 1 out of 5, 0 percent (n = 0) agreed that the statement was at a level 2 out of 5, 5 percent (n = 5) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 25 percent (n = 24) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 69 percent (n = 66) of the respondents agreed that the statement was very important.

The majority 94 percent (n = 90) of the respondents agreed with the statement that guidelines on feeding the dairy cow is very important to them with regard to their farming operation. The dairy cow needs to produce good quality milk and she can only do this if her nutrition is of good quality. Therefore, it is important for dairy farmers to feed their cows correctly. Cows that are fed well on a dairy farm will in the end produce good quality milk. In Section 3.3.3, information on nutrition is shown from literature to be of great importance in dairy farming (Morton, 2007; Milk SA, 2014; Herdt, 2014).
Figure 5-26 Importance of Guidelines on Feeding the Dry Cow

Figure 5-26 depicts the responses received 99 percent (n = 95) for the question; “Guidelines on feeding the dry cow?” The Mean for the question is $m = 4.46$ and the Standard Deviation is 0.71. The respondents who participated indicated that 0 percent (n = 0) agreed that the statement was at a level 1 out of 5, 1 percent (n = 1) agreed that the statement was at a level 2 out of 5, 9 percent (n = 9) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 32 percent (n = 30) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 58 percent (n = 55) of the respondents agreed that the statement was very important.

The majority 90 percent (n = 85) of the respondents agreed with the statement that guidelines on feeding the dry cow is very important to them with regard to their farming operations. The dry cow needs to rest during her sixty day dry period. During this period she needs to be in a good condition in order to be able to calve with ease. Therefore, it is important for dairy farmers to feed their dry cows correctly. Dry cows that are fed well on a dairy farm will in the end produce good quality milk. In Section 3.3.3, information on nutrition is shown from literature to be of great importance in dairy farming (Morton, 2007; Milk SA, 2014; Herdt, 2014).
Figure 5.27 Importance of Information on Important Dates in the District

Figure 5.27 depicts the responses received 99 percent (n = 95) for the question; “Information on important dates in the district?”. The Mean for the question is $m = 3.42$ and the Standard Deviation is 1.11. The respondents who participated indicated that 5 percent (n = 5) agreed that the statement was at a level 1 out of 5, 14 percent (n = 13) agreed that the statement was at a level 2 out of 5, 34 percent (n = 32) of the respondents indicated that they agreed that the statement was at a level 3 out of 5, 28 percent (n = 27) of the respondents indicated that they agreed that the statement was at a level 4 out of 5 and 19 percent (n = 18) of the respondents agreed that the statement was very important.

The majority 34 percent (n = 32) of the respondents were neutral about the statement that information on important dates in the district are important to them with regard to their farming operations. Information on important dates in the district will have no impact on the decisions that dairy farmers need to make in order to make a success of their farming operations. Therefore, the majority of the respondents had a neutral answer.

5.2.2.6 Summary of Findings in Section 3

In Section 3, the information collected by the IaaSDFS focussed on the importance of information required by dairy farmers that participated in the survey. The majority of the respondents indicated that the questions that were asked in Section 3, were of great importance for their decision-making on farming.
The respondents who used a pasture system to milk their cows indicated that information on planting dates for certain pastures was very important for them. Similar findings were reported in studies done by Lassen, 2012. The planting dates for pastures were of very little importance to the respondents who milked their cows on a TMR system. The importance of information on the correct utilisation and management of pastures was equally important to respondents using the pasture system and those using the TMR system.

Information on TMR systems was very important for the respondents that milked their cows on a TMR system. The importance of information on a TMR system was of very little importance for respondents milking their cows on a pasture system.

The importance of important dates in the district were of little importance for the respondents milking their cows on either a pasture or a TMR system. The important dates in a district will not have any impact on the decisions taken on the dairy farms.

The researcher needed to understand what information on agricultural organisations dairy farmers required. Therefore, questions on the information of agricultural organisations required by dairy farmers had to be answered. The following subsection will elaborate on the findings for Section 4: Information about Agricultural Organisations.

5.2.2.7 Section 4: Information about Agricultural Organisations

In Section 4, the focus is on agricultural organisations and the IaaSDFS collected information on agricultural organisations. The researcher will only discuss 5 of the most important questions answered by the respondents in the survey, which had 20 questions that the respondents had to answer. It was compulsory for the respondents to answer all the questions. The researcher had to collect the data in order to better understand the needs that the dairy farmers have concerning agricultural organisations. The fields in this section included:

- Agricultural Organisations: Accurate Market Information;
- Agricultural Organisations: Personalised Information;
- Agricultural Organisations: Information Neatly Presented;
- Agricultural Organisations: Needs; and
- Agricultural Organisations: Trustworthy Information.
The questions were answered by means of a Likert Scale, where 1 indicated that the respondents strongly disagreed with the statement, 3 indicated that respondents were Neutral towards the statement and 5 indicated that the respondents strongly agreed with the statement. The Cronbach Alpha coefficient for Section 4 produced a value of 0.96, this means that Section 4 had excellent reliability. The findings produced a t-test of 2.92 and $p < 0.0005$, which indicates that a statistical, significant relationship exists between the importance of information and information provided by agricultural organisations. The findings produced $\chi^2 = 8.62$ which stems from $d.f. = 1$ and $n = 95$, $p = 0.03$ which indicates that a larger proportion of farmers in the Eastern Cape are positive when compared with the other provinces. Variance = 0.30 which indicates that there is a medium variation from the mean and consequently the individual numbers vary from each other within the data set. The findings produced $\chi^2 = 1.27$ which stem from $d.f. = 1$ and $n = 93$, $p = 0.260$ which indicates that there is no significant difference between the farming systems and the information on agricultural organisations for dairy farmers.

Figure 5-28 Agricultural Organisations: Accurate Market Information

Figure 5-28 depicts the responses received 99 percent ($n = 95$) for the statement; “Agricultural organisations have up-to-date, accurate market information.”. The Mean for the question is $m = 3.62$ and the Standard Deviation is 0.83. The respondents who participated indicated that 0 percent ($n = 0$) strongly disagreed with the statement, 38 percent ($n = 36$) of the respondents indicated that they were neutral towards the
statement and 15 percent \((n = 14)\) of the respondents indicated that they strongly agreed with the statement.

The majority 40 percent \((n = 38)\) of the respondents agreed with the statement; “Agricultural organisations have up-to-date, accurate market information.”. The number of answers that were neutral towards this question was almost equal to the number of respondents that agreed with the statement.

![Agricultural Organisations provide Personalised Information](image)

**Figure 5-29 Agricultural Organisations: Personalised Information**

Figure 5-29 depicts the responses received 99 percent \((n = 95)\) for the statement; “Agricultural organisations provide me with personalised information.”. The Mean for the question is \(m = 3.42\) and the Standard Deviation is 0.96. The respondents who participated indicated that 4 percent \((n = 4)\) strongly disagreed with the statement, 38 percent \((n = 36)\) of the respondents indicated that they were neutral towards the statement and 12 percent \((n = 11)\) of the respondents indicated that they strongly agreed with the statement.

The majority 38 percent \((n = 36)\) of the respondents were neutral towards the statement; “Agricultural organisations provide me with personalised information.”.
Figure 5-30 Agricultural Organisations: Neatly Presented Information

Figure 5-30 depicts the responses received 99 percent (n = 95) for the statement; “Information from agricultural organisations is well presented with a neat appearance.”. The Mean for the question is \( m = 3.72 \) and the Standard Deviation is 0.85. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 32 percent (n = 30) of the respondents indicated that they were neutral towards the statement and 18 percent (n = 17) of the respondents indicated that they strongly agreed with the statement.

The majority 61 percent (n = 58) of the respondents agreed with the statement; “Information from agricultural organisations is well presented with a neat appearance.”.
Figure 5-31 Agricultural Organisations: Needs

Figure 5-31 depicts the responses received 99 percent (n = 95) for the statement; “Employees of agricultural organisations know what my needs are.”. The Mean for the question is $m = 3.44$ and the Standard Deviation is 0.88. The respondents who participated indicated that 1 percent (n = 1) strongly disagreed with the statement, 35 percent (n = 33) of the respondents indicated that they were neutral towards the statement and 9 percent (n = 9) of the respondents indicated that they strongly agreed with the statement.

The majority 50 percent (n = 48) of the respondents agreed with the statement; “Employees of agricultural organisations know what my needs are.”.
Figure 5-32 Agricultural Organisations: Trustworthy Information

Figure 5-32 depicts the responses received 99 percent (n = 95) for the statement; “I trust the information provided by agricultural organisations.”. The Mean for the question is $m = 3.64$ and the Standard Deviation is $0.87$. The respondents who participated indicated that 1 percent (n = 1) strongly disagreed with the statement, 31 percent (n = 29) of the respondents indicated that they were neutral towards the statement and 15 percent (n = 14) of the respondents indicated that they strongly agreed with the statement.

The majority 60 percent (n = 57) of the respondents agreed with the statement; I trust the information provided by agricultural organisations.

5.2.2.8 Summary of Findings in Section 4

The respondents answered the questions in Section 4 of the survey with a positive attitude. The respondents agreed that agricultural organisations had accurate market information, personalised information, information that is neatly presented, understood their needs and agricultural organisations have information which can be trusted. Limited answers to the statements had the reply, “strongly agree”.

The researcher needed to understand information about De Heus that dairy farmers required, therefore questions asked by farmers about De Heus had to be answered satisfactorily. The following sub-section will elaborate on the findings for Section 5: Customer Satisfaction – De Heus.
In Section 5, the IaaSDFS collected information about agricultural organisations. The researcher will only discuss 5 of the most important questions answered by the respondents in the survey. Section 5 had the very same questions as Section 4, with the focus on De Heus in Section 5 instead of agricultural organisations in Section 4. In Section 5, the survey had 20 questions that the respondents had to answer. In Section 5, the question could only be answered by De Heus customers. The researcher had to collect the data in order to better understand the needs that the dairy farmers have in their relations with agricultural organisations. The fields in this section included:

- De Heus: Accurate Market Information;
- De Heus: Personalised Information;
- De Heus: Information Neatly Presented;
- De Heus: Needs; and
- De Heus: Trustworthy Information.

The questions were answered by means of a Likert Scale, where 1 indicated that the respondents’ strongly disagreed with the statement, 3 indicated that respondents were neutral towards the statement and 5 indicated that the respondents strongly agreed with the statement. The Cronbach Alpha coefficient for Section 5 produced a value of 0.97, this means that Section 5 has an excellent reliability. The findings produced a t-test of 10.91 and \( p < 0.0005 \), which indicates that a statistical, significant relationship exists between the importance of information and information provided by De Heus. The findings produced \( \chi^2 = 0.80 \) which stems from d.f. = 1 and \( n = 95 \), \( p = 0.370 \) which indicates that there is no significant difference between the Eastern Cape province and the other provinces with regard to customer satisfaction levels for dairy farmers with De Heus. The findings produced \( \chi^2 = 0.43 \) which stems from d.f. = 1 and \( n = 47 \), \( p = 0.551 \) which indicates that there is no significant difference between the farming systems and the customer satisfaction levels for dairy farmers with De Heus.
Figure 5-33 depicts the responses received 51 percent (n = 49) for the statement; “De Heus has up-to-date, accurate market information.”. The Mean for the question is $m = 4.14$ and the Standard Deviation is 0.68. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 16 percent (n = 8) of the respondents indicated that they were neutral towards the statement and 31 percent (n = 15) of the respondents indicated that they strongly agreed with the statement.

The majority 84 percent (n = 41) of the respondents agreed with the statement; “De Heus has up-to-date, accurate market information.”.
Figure 5-34 De Heus: Personalised Information

Figure 5-34 depicts the responses received 51 percent (n = 49) for the statement; “*De Heus provides me with personalised information.*”. The Mean for the question is $m = 4.18$ and the Standard Deviation is 0.63. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 12 percent (n = 6) of the respondents indicated that they were neutral towards the statement and 31 percent (n = 15) of the respondents indicated that they strongly agreed with the statement.

The majority 88 percent (n = 43) of the respondents agreed with the statement; “*De Heus provides me with personalised information.*”.

Figure 5-35 De Heus: Information Neatly Presented
Figure 5-35 depicts the responses received 51 percent (n = 49) for the statement; “Information from De Heus is well presented with a neat appearance.”. The Mean for the question is $m = 4.31$ and the Standard Deviation is 0.62. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 8 percent (n = 4) of the respondents indicated that they were neutral towards the statement and 39 percent (n = 19) of the respondents indicated that they strongly agreed with the statement.

The majority 92 percent (n = 45) of the respondents agreed with the statement; “Information from De Heus is well presented with a neat appearance.”.

![De Heus knows my Needs](chart)

**De Heus knows my Needs**

Figure 5-36 De Heus: Needs

Figure 5-36 depicts the responses received 51 percent (n = 49) for the statement; “De Heus employees know what my needs are.”. The Mean for the question is $m = 4.29$ and the Standard Deviation is 0.65. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 4 percent (n = 2) of the respondents indicated that they were neutral towards the statement and 37 percent (n = 18) of the respondents indicated that they strongly agreed with the statement.

The majority 94 percent (n = 46) of the respondents agreed with the statement; “De Heus employees do know what my needs are.”.
Figure 5-37 De Heus: Trustworthy Information

Figure 5-37 depicts the responses received 51 percent (n = 49) for the statement; “I trust the information provided by De Heus.”. The Mean for the question is $m = 4.29$ and the Standard Deviation is 0.68. The respondents who participated indicated that 0 percent (n = 0) strongly disagreed with the statement, 12 percent (n = 6) of the respondents indicated that they were neutral towards the statement and 41 percent (n = 20) of the respondents indicated that they strongly agreed with the statement.

The majority 88 percent (n = 43) of the respondents agreed with the statement; “I trust the information provided by De Heus.”.

5.2.3.0 Summary of Findings in Section 5

The respondents answered the questions in Section 5 of the survey with a positive attitude. The respondents agreed that De Heus had accurate market information, personalised information, information that is neatly presented, understood their needs and that De Heus has trustworthy information. None of the answers to the statements had the reply, “strongly disagree”.

The researcher needed to understand what information dairy farmers require on Internet Usage. Therefore, questions on Internet Usage required by dairy farmers had to be answered. The following sub-section will elaborate on the findings for Section 6: Internet Usage.
5.2.3.1 Section 6: Internet Usage

In Section 6, the IaaSDFS collected information on the Internet utilisation by dairy farmers. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Where you most often use the Internet;
- Devices utilised to access the Internet;
- Types of Internet connections;
- Number of days accessing the Internet;
- Number of hours spent on the Internet;
- Purpose of Internet utilisation; and
- Conduct of business without the Internet.

The questions were answered by means of Multiple Choice. The majority of the questions in Section 6 can have more than one answer.

![Figure 5-38 Usage of the Internet](image)

Figure 5-38 Usage of the Internet

Figure 5-38 depicts the responses received 90 percent \((n = 86)\) for the question; “Where are you most often when you use the Internet?”. The respondents who participated indicated that 60 percent \((n = 52)\) utilised the Internet when they were at home and 40 percent \((n = 34)\) utilised the Internet while they were at work.

The majority 60 percent \((n = 52)\) of the respondents utilised the Internet while they were at home. Dairy farmers, in general, do work from home and it is normal for them
to have their office at home. The results are similar to findings done by Simpson and Calitz, 2014, where their results showed that 55 percent of the respondents use the Internet at home and 32 percent access the Internet while they at work. Their results showed that 10 percent access the Internet when they are outside. The place where dairy farmers access the Internet will determine the kind of technology used by the dairy farmer.

![Diagram of Devices used to Access the Internet](image)

**Figure 5-39 Devices used to Access the Internet**

Figure 5-39 depicts the responses received 98 percent (n = 94) for the question; “*What devices do you use to access the Internet?*”. The Mean for the question is $m = 1.85$ and the Standard Deviation is 0.95. The respondents who participated indicated that 49 percent (n = 46) utilised their Laptops to access the Internet; 51 percent (n = 48) indicated that they utilise their Mobile Phones to access the Internet; 63 percent (n = 59) indicated that they utilise their PCs to access the Internet and 22 percent (n = 21) indicated that they utilise their Tablets to access the Internet.

The majority 63 percent (n = 59) of the respondents utilised their PCs to access the Internet. In Figure 3-4 it is shown that the majority of South Africans utilise their Smart Phones to access the Internet. In Section 3.2.2 more respondents, according to literature, utilised their Laptops to access the Internet (Simpson, 2014). Results from research done by Simpson and Calitz, 2014, indicated that 68 percent of the grain producers access the Internet by using their Laptops. The results of this research
study showed that 63 percent of the dairy farmers access the Internet by using their PCs.

Figure 5-40 Usage of Internet Connections

Figure 5-40 depicts the responses received 98 percent (n = 94) for the question; “Which type of Internet connection do you have?”. The Mean for the question is $m = 1.30$ and the Standard Deviation is 0.58. The respondents who participated indicated that 22 percent (n = 21) utilised an ADSL line to access the Internet; 32 percent (n = 30) indicated that they utilise their Mobile Phones to access the Internet; 60 percent (n = 56) indicated that they utilise a Wireless connection to access the Internet; 14 percent (n = 13) indicated that they use a Satellite connection to access the Internet and 3 percent (n = 3) indicated that they utilise other connections to access the Internet.

The majority 60 percent (n = 56) of the respondents utilised a Wireless connection to access the Internet. A Wireless connection makes it easier for technology to be used when a dairy farmer is not on the farm. Dairy farmers can because of a Wireless connection log into his milking system from where ever they are. Results from research done by Simpson, 2014, shows that 57 percent of their respondents use their Mobile Phone for Internet connection, 43 percent use a Wireless connection to access the Internet, 22 percent use an ADSL connection to access the Internet, 14 percent use a Satellite connection to access the Internet and 2 percent use a other connection to access the Internet.
Figure 5-41 Days per Week the Internet is Accessed

Figure 5-41 depicts the responses received 98 percent (n = 94) for the question; “On average, how many days per week do you access the Internet?” The respondents who participated indicated that 3 percent (n = 3) accessed the Internet for one day per week; 4 percent (n = 4) indicated that they accessed the Internet for two days per week; 4 percent (n = 4) indicated that they accessed the Internet for three days per week; 5 percent (n = 5) indicated that they accessed the Internet for four days per week; 21 percent (n = 20) indicated that they accessed the Internet for five days per week; 11 percent (n = 10) indicated that they accessed the Internet for six days per week and 51 percent (n = 48) indicated that they accessed the Internet for seven days per week.

The majority 51 percent (n = 48) of the respondents utilised the Internet seven days a week. Therefore, dairy farmers utilise the Internet on a frequent basis. The utilisation of the Internet could be either for private or business use. The results from research done by Simpson, 2014, indicated that 99 percent of the grain producers access the Internet on a daily basis.
Figure 5-42 Hours per day spent on the Internet

Figure 5-42 depicts the responses received 98 percent ($n = 94$) for the question; “How many hours on average do you spent on the Internet per day?”. The respondents who participated indicated that 3 percent ($n = 3$) do not spend time on the Internet; 85 percent ($n = 80$) indicated that they spend between one to two hours per day on the Internet; 9 percent ($n = 8$) indicated that they spend between three to four hours per day on the Internet and 3 percent ($n = 3$) indicated that they spend between five to six hours per day on the Internet.

The majority 85 percent ($n = 80$) of the respondents utilised the Internet between one to two hours per day. Therefore, dairy farmers utilise the Internet on a frequent basis. The utilisation of the Internet could be either for private or business usage. Results from research done by Simpson and Calitz, 2014, shows that 31 percent spent an hour or less, 40 percent between one and two hours, 13 percent between two and three hours and 16 percent more than four hours a day accessing the Internet.

Dairy farmers spent most of their time accessing the Internet between one and two hours per day. The reason why dairy farmers spent less time accessing the Internet is because of the short period of the day that they spent in the office or at home.
Figure 5-43 Purpose of Internet Usage

Figure 5-43 depicts the responses received 98 percent (n = 94) for the question; “What do you use the Internet for?”. The Mean for the question is $m = 3.69$ and the Standard Deviation is 1.41. The respondents who participated indicated that 85 percent (n = 80) utilise the Internet for their emails; 89 percent (n = 84) indicated that they utilise the Internet for their Banking; 53 percent (n = 50) indicated that they utilise the Internet for News; 40 percent (n = 38) indicated that they utilise the Internet for Social Media – Facebook, Twitter etc.; 3 percent (n = 3) indicated that they utilise the Internet for Games; 73 percent (n = 69) indicated that they utilise the Internet for Information; 20 percent (n = 19) indicated that they utilise the Internet for Sport Results and 4 percent (n = 4) indicated that they utilise the Internet for other uses.

The majority 89 percent (n = 84) of the respondents utilised the Internet for banking. Therefore, dairy farmers utilise the Internet for either business or private usage. The results from the research done by Simpson and Calitz, 2014, indicated that 94 percent access the Internet to use Email, 91 percent access the Internet to use banking and business usage also scored highly at 84 percent. The importance of the research indicated that 79 percent of the farmers accessed the Internet to source information. The results of Simpson and Calitz, 2014, compared well with the results of this research study.
Figure 5-44 Conduct Business without the Internet

Figure 5-44 depicts the responses received 96 percent (n = 92) for the question; “Could you conduct your business without the Internet?” The respondents who participated indicated that 16 percent (n = 15) could conduct their business without the Internet; 82 percent (n = 75) indicated that they could not conduct their business without the Internet and 2 percent (n = 2) indicated that they did not know whether they could conduct their business without the Internet.

The majority 82 percent (n = 75) of the respondents indicated that they could not conduct their business without the Internet. The utilisation of the Internet could be either for private or business usage as shown in Figure 5-43.

5.2.3.2 Summary of Findings in Section 6

In Section 6, the answers to the IaaSDFS focussed on the usage of the Internet by dairy farmers. The respondents indicated that the majority of them use the Internet at home. Dairy farmers will mostly have their office space at home and therefore it is normal for them to do their business from home.

The majority 63 percent (n = 59) of the respondents indicated that they access the Internet via their PCs. In Figure 3-4 it is shown that the majority of South Africans utilise their Smart Phones to access the Internet. In Section 3.2.2 more respondents according to literature utilised their Laptops to access the Internet. Results conducted by Simpson and Calitz, 2014, indicated that their respondents also use their Laptops
The majority 60 percent (n = 56) of the respondents indicated that they use a wireless connection to access the Internet. The Internet is accessed seven days per week by dairy farmers in order to do their business through the Internet. The majority 85 percent (n = 80), 89 percent (n = 84) and 73 percent (n = 69) respectively of the respondents use the Internet mainly for email, banking and to access information that they require. The respondents spent between one to two hours per day on the Internet. The respondents indicated that they could not conduct their business without the Internet. The results from Simpson and Calitz, 2014, is similar to the results of this research study.

The researcher needed to understand what information on Mobile Device Usage that dairy farmers require. Therefore, questions on Mobile Device Usage required by dairy farmers had to be answered. The following sub-section will elaborate on the findings for Section 7: Mobile Device Usage.

5.2.3.3 Section 7: Mobile Device Usage

In Section 7, the IaaSDFS collected information on the Mobile Device utilisation by dairy farmers. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Service Providers;
- Utilisation of Mobile Phone for Internet;
- Usage of a Mobile Phone;
- Mobile Phone Types;
- Conduct of business without your Mobile Phone;
- Usage of a Tablet; and
- Conduct of business without a Tablet.

The questions were answered by means of Multiple Choice. The majority of the questions in Section 7 can have more than one answer.
Figure 5-45 Service Providers

Figure 5-45 depicts the responses received 100 percent (n = 96) for the question; “Who is your service provider?”. The Mean for the question is \( m = 1.11 \) and the Standard Deviation is 0.32. The respondents who participated indicated that 66 percent (n = 63) utilised Vodacom as their service provider; 22 percent (n = 21) indicated that they utilised MTN as their service provider; 9 percent (n = 9) indicated that they utilised Cell C as their service provider; 5 percent (n = 5) indicated that they utilised Telkom Mobile as their service provider and 9 (n = 9) percent indicated that they utilised other service providers.

The majority 66 percent (n = 63) of the respondents utilised Vodacom as their service provider. The importance of this question in the survey needs to be underlined, because planning needs to be done by service providers in order to supply their customers with the sufficient network coverage. Dairy farmers are normally situated in areas where network coverage can become a problem. Problems with network coverage can influence the usage of technology that they use on a daily basis in their farming operation.
Figure 5-46 Usage of Mobile Phone for Internet

Figure 5-46 depicts the responses received 99 percent (n = 95) for the question; “Do you use your mobile phone for the Internet?”. The respondents that participated indicated that 75 percent (n = 71) utilised their mobile phones for the Internet and 25 percent (n = 24) indicated that they do not utilising their mobile phones for the Internet.

The majority 75 percent (n = 71) of the respondents indicated that they utilise their mobile phones for the Internet. The results from research done by Simpson, 2014, indicated that 69 percent of the respondents use their Mobile Phones to access the Internet and 31 percent do not use their Mobile Phones to access the Internet. The results of this research study has a similar outcome. The usage of mobile phones to access the Internet by dairy farmers makes the availability of information more accessible to them. Dairy farmers can therefore log into the technology that they use in their farming operation from where ever they are. The solving of problems is made easier by using their mobile phones to access the Internet.
Figure 5-47 Usage of Mobile Phone

Figure 5-47 depicts the responses received 100 percent (n = 96) for the question; “What do you use your mobile phone for?”. The Mean for the question is m = 4.71 and the Standard Deviation is 2.31. The respondents who participated indicated that 99 percent (n = 95) utilised their mobile phones to phone; 92 percent (n = 88) indicated that they utilised their mobile phones to SMS; 73 percent (n = 70) indicated that they utilised mobile phones for taking photos; 44 percent (n = 42) indicated that they utilised their mobile phones for Messaging: BBM, WhatsApp, etc.; 48 percent (n = 46) indicated that they utilised their mobile phones to email; 46 percent (n = 44) indicated that they utilised their mobile phones to do business; 29 percent (n = 28) indicated that they utilised their mobile phones for Social Media – Facebook, Twitter, etc.; 9 percent (n = 9) indicated that they utilised their mobile phones for Games; 30 percent (n = 29) indicated that they utilised their mobile phones for Apps and 1 percent (n = 1) indicated that they utilised their mobile phones for other usages.

The majority 99 percent (n = 95) of the respondents utilised their mobile phones for phoning. The results of research done by Simpson, 2014, indicated that 96 percent of the respondents use their Mobile Phones to phone, 90 percent of the respondents use their Mobile Phone to send a SMS and 69 percent of the respondents use their Mobile Phones to take photos. The results of this research study compares well with the results of the research studies done by Simpson, 2014.
Figure 5-48 Mobile Phone Types

Figure 5-48 depicts the responses received 100 percent (n = 96) for the question; “What make of mobile phone you have?”. The Mean for the question is $m = 1.02$ and the Standard Deviation is 0.20. The respondents who participated indicated that 11 percent (n = 11) had an Apple phone; 6 percent (n = 6) indicated that they had a Blackberry phone; 21 percent (n = 20) indicated that they had a Nokia phone; 46 percent (n = 44) indicated that they had a Samsung phone; 11 percent (n = 11) indicated that they had a Sony Ericsson phone and 6 percent (n = 6) indicated that they had a CAT phone.

The majority 46 percent (n = 44) of the respondents utilised a Samsung phone. The mobile phone manufactures needs to pay attention to the type of software and apps that they need to develop for dairy farmer to use their mobile phones more effectively. The results from research done by Simpson, 2014, indicated that 31 percent of the respondents used a Samsung phone, 29 percent used a Blackberry phone, 21 percent used a Nokia, 12 percent used an Apple phone, 4 percent used another make of phone and 3 percent used a Sony Ericson phone. The results of this research study compares well with the results shown by the research done by Simpson, 2014. Certain makes of phones did disappear from the market.
Figure 5-49 Conduct your Business without your Mobile Phone

Figure 5-49 depicts the responses received 100 percent (n = 96) for the question; “Could you conduct your business without your mobile phone?”. The respondents who participated indicated that 9 percent (n = 9) could conduct their business without their mobile phones; 89 percent (n = 85) indicated that they could not conduct their business without their mobile phones and 2 percent (n = 2) indicated that they do not know if they could conduct their business without their mobile phones.

The majority 89 percent (n = 85) of the respondents indicated that they could not conduct their business without their mobile phones.

Figure 5-50 Respondents using a Tablet
Figure 5-50 depicts the responses received 95 percent \((n = 95)\) for the question; \(\text{“Do you have a Tablet?”}\). The respondents who participated indicated that 38 percent \((n = 36)\) had Tablets and 62 percent \((n = 59)\) indicated that they do not have Tablets.

The majority 62 percent \((n = 59)\) of the respondents indicated that they did not have Tablets.

![Operating Systems for a Tablet](image)

Figure 5-51 Operating Systems for a Tablet

Figure 5-51 depicts the responses received 100 percent \((n = 96)\) for the question; \(\text{“If you have a Tablet, what make of operating system does it have?”}\). The Mean for the question is \(m = 0.40\) and the Standard Deviation is 0.51. The respondents who participated indicated that 22 percent \((n = 21)\) of the Tablets had an Android operating system; 10 percent \((n = 10)\) indicated that their Tablets had an Apple OS operating system and 7 percent \((n = 7)\) indicated that their Tablets had a Microsoft operating system.

The majority 22 percent \((n = 21)\) of the respondents indicated that their Tablets had an Android operating system. The results from research done by Simpson, 2014, indicated that 47 percent of the Tablets had an Apple OS operating system, 40 percent had an Android operating system, 4 percent had a Microsoft operating system and 9 percent had another operating system. In the results of this research study done with dairy farmers the Android operating system has gained market share compared to the Apple operating system.
Different Usages for the Tablet

Figure 5-52 Different Usages for the Tablet

Figure 5-52 depicts the responses received 35 percent (n = 34) for the question; “If you have a Tablet, what do you use it for?”. The Mean for the question is \( m = 4.50 \) and the Standard Deviation is 2.44. The respondents who participated indicated that 74 percent (n = 25) utilised their tablets for email; 56 percent (n = 19) indicated that they utilised their tablets for banking; 50 percent (n = 17) indicated that they utilised tablets for business; 59 percent (n = 20) indicated that they utilised their tablets for news; 53 percent (n = 18) indicated that they utilised their tablets for Apps; 9 percent (n = 3) indicated that they utilised their tablets to play Games; 62 percent (n = 21) indicated that they utilised their tablets for Information; 32 percent (n = 11) indicated that they utilised their tablets for Sports Results; 15 percent (n = 5) indicated that they utilised their tablets for eBooks; 38 percent (n = 13) indicated that they utilised their tablets for Social Media – Facebook, Twitter, etc. and 3 percent (n = 1) indicated that they utilised their tablets for other usages.

The majority 74 percent (n = 25) of the respondents utilised their tablets for email. Tablets can be used more effectively by dairy farmers if the correct software and apps are developed for the dairy industry. The results of research done by Simpson, 2014, indicated that 38 percent of the respondents use their Tablets for Email purposes, 33 percent for banking purposes, 32 percent for business purposes, 30 percent for business purposes, 27 percent for the news, 22 percent for apps, 21 percent for Social Media, 15 percent for EBooks, 9 percent for sports results, 7 percent for games and 6
percent for other uses. The results of this research study done with dairy farmers compares well with the results of the research done by Simpson, 2014.

![Conduct your Business without a Tablet](image)

Figure 5-53 Conduct your Business without a Tablet

Figure 5-53 depicts the responses received 54 percent (n = 52) for the question; “Could you run your business without your tablet?”. The respondents who participated indicated that 69 percent (n = 36) could conduct their business without a tablet; 10 percent (n = 5) indicated that they could not conduct their business without a tablet and 21 percent (n = 11) indicated that they did not know if they could conduct their business without a tablet.

The majority 69 percent (n = 36) of the respondents indicated that they could conduct their business without a tablet. A tablet is still a new device for farmers to get used to. Tablets normally do not have any programmes such as Excel or Word, and that could be the reason why dairy farmers can conduct their business without a tablet. Programme developers can develop the correct software and apps for dairy farmers to use Tablets more effectively in their farming operation.

5.2.3.4 Summary of Findings in Section 7

The respondents answered questions in Section 7 about their mobile device usage. The respondents indicated that the majority of them use Vodacom as their service provider. The service provider might differ in the different areas of the research, this will depend on the availability of the service in the rural areas where the dairy farmers
operate. The service providers need to make sure that their service networks are available, because the majority 75 percent (n = 71) of the respondents indicated that they use their mobile phones to access the Internet. The results compare well with the 69 percent of results shown by Simpson, 2014.

The majority 99 percent (n = 95), 92 percent (n = 88) and 73 percent (n = 70) respectively of the respondents indicated that they use their mobile phones to phone, SMS and to take photos. Messaging, emailing and doing business on their phones is also a high priority. The results compare well with the 96 percent, 90 percent and 69 percent respectively of the respondent indicated that they use their mobile phones to phone, SMS and to take photos with results shown by Simpson, 2014.

The majority 46 percent (n = 44) of the respondents indicated that they use a Samsung phone in their farming operation. In Section 3.2.3 previous research had the same outcome that Samsung phones were the most popular device used (Simpson, 2014). Dairy farmers have become accustomed to using their mobile phones, because the majority 89 percent (n = 85) of the respondents indicated that they cannot conduct their business without their mobile phones.

The majority 62 percent (n = 59) of respondents indicated that they do not use a tablet. The respondents who use a tablet indicated that their tablets use mainly an Android operating system. The majority 74 percent (n = 25), 59 percent (n = 20) and 62 percent (n = 21) of the respondents indicated that they use their tablets mainly for emailing, news and for information. In Section 3.2.3 previous research had the same outcome that the farming community adopted the tablet for business purposes (Simpson, 2014). The majority 69 percent (n = 36) of the respondents indicated that they can conduct their business without a tablet. Programme developers can develop the correct software and apps for dairy farmers to use Tablets more effectively in their farming operation.

The researcher needed to understand information on the Application Usage that dairy farmers require. Therefore, questions on the Application Usage required by dairy farmers had to be answered. The following sub-section will elaborate on the findings for Section 8: Application (Apps) Usage.
5.2.3.5 Section 8: Application (Apps) Usage

In Section 8, the IaaSDFS collected information on the App utilisation by dairy farmers. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Type of Apps;
- Number of free Apps; and
- Apps utilised daily on Mobile Devices.

The questions were answered by means of Multiple Choice. The majority of the questions in Section 8 can have more than one answer.

Figure 5-54 Type of Apps on Mobile Devices

Figure 5-54 depicts the responses received 86 percent (n = 83) for the question; “Which type of apps do you currently have on your mobile devices?”. The Mean for the question is \( m = 3.16 \) and the Standard Deviation is 1.70. The respondents who participated indicated that 80 percent (n = 66) had Utility Apps on their mobile devices; 18 percent (n = 15) indicated that they Entertainment Apps on their mobile devices; 16 percent (n = 13) indicated that they had Games Apps on their mobile devices; 48 percent (n = 40) indicated that they had News Apps on their mobile devices; 59 percent (n = 49) indicated that they had Banking Apps on their mobile devices; 52 percent (n = 43) indicated that they had Productivity Apps on their mobile devices; 33 percent (n = 27) indicated that they had Social Media Apps on their mobile devices and 11 percent (n = 9) indicated that they had other apps on their mobile devices.
The majority 80 percent (n = 66) of the respondents indicated that they had Utility Apps on their mobile devices. Utility Apps are normally loaded on the mobile devices by the manufacturer of the specific device. Utility Apps is a collective name for calculate, convert, translate, etc. Apps needs to be developed that dairy farmers can use more effectively in their dairy farming operation. The apps developed for the dairy farmer specifically will help them use technology more effectively in their farming operation. The results of research done by Simpson, 2014, 69 percent of the respondents indicated that they installed the Weather App, 61 percent indicated that they installed the Banking App, 55 percent indicated that they installed the Productivity App, 47 percent indicated that the installed the News App, 42 percent indicated that they installed the Utility App, 40 percent indicated that they installed the Social Media App, 28 percent indicated that they installed the Financial App, 13 percent indicated that they installed the Games App, 12 percent indicated that they installed the Travel App, 6 percent indicated that they installed the Entertainment App and 2 percent indicated that they installed another App. The results of this research study done with dairy farmers compares well with the results done by Simpson, 2014.

Figure 5-55 Number of Free Apps

Figure 5-55 depicts the responses received 86 percent (n = 83) for the question; “Of the apps you currently have on your mobile devices, about how many were free?” The respondents who participated indicated that 57 percent (n = 47) received all the apps on their mobile devices for free; 28 percent (n = 23) indicated that they received
most of their apps on their mobile devices for free, 4 percent \((n = 3)\) indicated that they received about half of their apps on their mobile devices for free, 7 percent \((n = 6)\) indicated that they received some of their apps on their mobile devices for free and 5 percent \((n = 4)\) indicated that they received none of their apps on their mobile devices for free.

The majority 57 percent \((n = 47)\) of the respondents indicated that they received all of their apps on their mobile devices for free.

![Figure 5-56 Apps used in a Typical Day](image)

Figure 5-56 Apps used in a Typical Day

Figure 5-56 depicts the responses received 88 percent \((n = 84)\) for the question; “In a typical day which type of apps do you use on your mobile devices most often?” The Mean for the question is \(m = 2.76\) and the Standard Deviation is 1.54. The respondents who participated indicated that 58 percent \((n = 49)\) utilised Utility Apps on their mobile devices; 1 percent \((n = 1)\) indicated that they utilised Entertainment Apps on their mobile devices; 5 percent \((n = 4)\) indicated that they utilised Game Apps on their mobile devices; 33 percent \((n = 28)\) indicated that they utilised News Apps on their mobile devices; 36 percent \((n = 30)\) indicated that they utilised Banking Apps on their mobile devices; 36 percent \((n = 30)\) indicated that they utilised Productivity Apps on their mobile devices; 30 percent \((n = 25)\) indicated that they utilised Social Media Apps on their mobile devices; 1 percent \((n = 1)\) indicated that they utilised Travel Apps on their mobile devices; 65 percent \((n = 55)\) indicated that they utilised Weather Apps on their mobile devices; 10 percent \((n = 8)\) indicated that they utilised Financial...
Instruments on their mobile devices; 1 percent \((n = 1)\) indicated that they utilised Hunting Apps on their mobile devices and 1 percent \((n = 1)\) indicated that they utilised other apps on their mobile devices.

The majority 65 percent \((n = 55)\) of the respondents indicated that they utilised Weather Apps on their mobile devices. In Figure 5-17 respondents indicated that the weather forecast is of great importance in their dairy farming operation. The results from research done by Simpson, 2014, indicated that 53 percent of the respondents used the Weather App the most frequently, 43 percent used the Banking App the most frequently, 38 percent used the Productivity App the most frequently, 34 percent used the News App the most frequently and 23 percent used the Social Media App the most frequently. The results of this research study done with dairy farmers compares well with the results done by Simpson, 2014.

5.2.3.6 Summary of Findings in Section 8

The majority 80 percent \((n = 66)\) of the respondents indicated that they have Utility Apps on their mobile devices. The Utility Apps are used to calculate, convert, translate, etc. The Utility Apps are normally loaded on the device by the manufacturer. The majority 57 percent \((n = 47)\) of respondents indicated that all of the apps on their devices were free, which means that they did not pay for them. The majority 65 percent \((n = 55)\) of the respondents indicated that they use the Weather App the most often on their devices. Weather plays an important role in the daily operations on a dairy farm. The importance of the weather on a dairy farm is shown by Figure 5-17. Apps can be developed for the specific needs of the dairy farmer by programme developers. Apps specifically developed for dairy farmers can help them in their decision making on their dairy farms. The results of this research study done with dairy farmers compares well with the research results shown by Simpson, 2014.

The researcher needed to understand the Information required by dairy farmers. Therefore, questions on the Information required by dairy farmers had to be answered. The following sub-section will elaborate on the findings for Section 9: Dairy Farmers Information Required.
In Section 9, the IaaSDFS collected Information required by dairy farmers. The researcher had to collect the data in order to better understand the needs that the dairy farmers have. The fields in this section included:

- Research of different market information;
- Most useful sources of information;
- Type of market indicators researched; and
- Importance of analysis.

The questions were answered by means of Multiple Choice. The majority of the questions in Section 9 can have more than one answer.

![Different Market Information Researched](image)

**Figure 5-57 Different Market Information Researched**

Figure 5-57 depicts the responses received 97 percent (n = 93) for the question; “How many days per week do you research different types of market information?”. The respondents who participated indicated that 10 percent (n = 9) do not research different markets during the week; 30 percent (n = 28) indicated that they research different markets for one day per week; 14 percent (n = 13) indicated that they research different markets for two days per week; 16 percent (n = 15) indicated that they research different markets for three days per week; 13 percent (n = 12) indicated that they research different markets for four days per week; 13 percent (n = 12) indicated that they research different markets for five days per week; 1 percent (n = 1)
indicated that they research different markets for six days per week and 3 percent (n = 3) indicated that they research different markets for seven days per week.

The majority 30 percent (n = 28) of the respondents researched different markets for one day a week. The importance of researching different markets indicate that dairy farmers need information for them to make good decisions in their farming operation.

![Most Useful Sources of Information](image)

**Figure 5-58 Most Useful Sources of Information**

Figure 5-58 depicts the responses received 99 percent (n = 95) for the question; “Which sources of information do you find most useful?”. The Mean for the question is $m = 2.88$ and the Standard Deviation is 1.39. The respondents who participated indicated that 56 percent (n = 53) found that the Landbouweekblad is a useful source of information; 8 percent (n = 8) indicated that they found that the Farmers Weekly is a useful source of information; 71 percent (n = 67) indicated that they found that the Dairy Mail is a useful source of information; 21 percent (n = 20) indicated that they found that Newspapers are a useful source of information; 28 percent (n = 27) indicated that they found that the Television (TV) is a useful source of information; 23 percent (n = 22) indicated that they found that Kyknet is a useful source of information; 78 percent (n = 74) indicated that they found that the Internet is a useful source of information and 3 percent (n = 3) indicated that they found that other sources of information was useful.
The majority 78 percent (n = 74) of the respondents indicated that the Internet is a useful source of information. Therefore, it is important for organisations to have the correct information about the organisation on the Internet. The Internet is a useful tool for the dairy farmer to gather information that they need in order to simplify their decision making process.

Figure 5-59 Types of Market Indicators Researched

Figure 5-59 depicts the responses received 96 percent (n = 92) for the question; “Which market indicators do you research?” The Mean for the question is $m = 2.72$ and the Standard Deviation is 1.30. The respondents who participated indicated that 62 percent (n = 57) researched the Rand/Dollar as market indicator; 4 percent (n = 4) indicated that they researched the Cbot as market indicator; 76 percent (n = 70) indicated that they researched the Milk Price as market indicator; 71 percent (n = 65) indicated that they researched the Maize Price as market indicator; 10 percent (n = 9) indicated that they researched the Gold Price as market indicator; 45 percent (n = 41) indicated that they researched the Oil Price as market indicator; 4 percent (n = 4) indicated that they researched other market indicators and 1 percent (n = 1) indicated that they did not research any market indicators.

The majority 76 percent (n = 70) of the respondents indicated that they research the Milk Price as a market indicator. Dairy farmers rely on the milk price as a source of income. Therefore, the milk price will be an important market indicator for dairy farmers.
Figure 5-60 Importance of Analyses

Figure 5-60 depicts the responses received 96 percent (n = 92) for the question; “What do you think is more important?” The respondents who participated indicated that 7 percent (n = 6) thought that Fundamental Analysis was more important than Technical Analysis; 20 percent (n = 18) indicated that they thought that Technical Analysis was more important than Fundamental Analysis and 74 percent (n = 68) indicated that they thought that both analyses were equally important.

The majority 74 percent (n = 68) of the respondents indicated that they thought that both analyses were equally important.

5.2.3.8 Summary of Findings in Section 9

The majority 30 percent (n = 28) of the respondents who answered Section 9, indicated that they research different types of market information one day a week. The respondents indicated that the majority 78 percent (n = 74) find the Internet as a useful source of information. The milk price is an important market indicator that the majority 76 percent (n = 70) of the respondents research. The majority 74 percent (n = 68) of the respondents indicated that both fundamental analysis and technical analysis are important in their decision-making processes.

5.2.3.9 Personal Details

Personal Details were used to collect the personal details of the respondents in the event that they would like feedback from the results of the research study. The criteria
used were the following: Name, Telephone Number and email address. The respondents who indicated that they would like feedback from the research study were 56 of the 96 that completed the research survey. The researcher will communicate the results to these respondents after completing the research study.

5.3 Summary

Chapter 5 addressed RQ7 which states; “What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?”. The chapter completed the RO7 which states; “Propose a communications framework, using Information as a Service, for dairy farmers.”.

Chapter 5, focused on the analysis and presentation of the findings of the IaaSDFS. The IaaSDFS was created by reviewing current literature studies which were aligned with the overall research question and research objective. The identified areas provided the researcher with information about what information dairy farmers require. The identified areas were then grouped into categories to ensure the correct flow of the IaaSDFS. The categories were Farming Practices, Importance of information to dairy farmers, Agricultural Organisations Information, Customer Satisfaction, Internet Usage, Mobile Device Usage, Application Usage and Dairy Farmers Information Required. The IaaSDFS was then distributed to dairy farmers in South Africa. The results were collected, analysed and presented in a logical and clear manner. The findings contributed to the Proposed Communication Framework for Dairy Farmers.

The findings highlighted in this chapter presented the information that dairy farmers require in their daily decision-making. The information gathered focused on the importance of certain information for dairy farmers. There are two types of dairy farmer namely: those that milk from pastures and those that milk from a TMR system. The information that the two groups of dairy farmers require do differ. The dairy farmer milking from pastures requires more information on the planting date of certain pastures and the correct utilisation and management of pastures. The above mentioned information is not important to a dairy farmer who farms on a TMR system, because they do not need pastures to feed their cows. The dairy farmer milking from a TMR system requires more information on the planting date for maize as silage and information on TMR systems. The two groups of dairy farmers do have a lot in common, because both parties do find the following as important information: weather
forecast, herd health, correct feeding for calves, correct feeding of the dairy cow and the correct feeding of the dry cow. The way in which dairy farmers use the Internet is the same for both these groups of dairy farmers. Dairy farmers use their mobile devices in the same way whether the milk their cows on pastures or milk their cows on a TMR system. The applications that these two groups use are the same. Agricultural organisations need to interact with organisations that can design applications that are required by dairy farmers in order to support the requirements of the dairy farmer.

Chapter 6, will present the Communication Framework for Dairy Farmers as derived from the findings. The chapter will conclude by providing the limitations of the study as well as suggestions for future research. Therefore, the research objective of chapter 6 would be focused on ROm, which would be to identify the information requirements of dairy farmers for farming-related decision making. Therefore, the research question needs to be answered, which states; “What information is required by dairy farmers to be included as Information as a Service?".
Chapter 6  RECOMMENDATIONS AND CONCLUSION

6.1  Introduction

Chapter 5, focused on the compiling and presentation of the findings of the IaaSDFS. The IaaSDFS was created by means of viewing current literature studies which were aligned with the overall research question and research objective. The IaaSDFS was distributed to dairy farmers in South Africa. The empirical results were collected, analysed and presented in a logical and clear manner.

Chapter 6, will address RQ\textsubscript{M}, which states; “What information is required by dairy farmers to be included as Information as a Service?” The objective of this chapter is to develop a Communication Framework for dairy farmers. The Communication Framework should assist agricultural organisations to provide relevant information to dairy farmers, in order to assist them with their decision-making. The objectives could only be achieved by accepting the following: firstly, communication strategies for dairy farmers needed to be identified. Secondly, technology utilised by dairy farmers needed to be identified. Thirdly, the research methodology applied to this research study had to be recognised. And lastly, an empirical evaluation of the IaaSDFS by dairy farmers had to be conducted. An overview of the RQs and ROs of Chapter 6 is presented in Figure 6-1.

Chapter 6, will summarise the research process followed in this research study. Thereafter, a list of recommendations and considerations will be presented according to the empirical data. The proposed Communication Framework for Dairy Farmers will then be presented and discussed. Chapter 6, will conclude by identifying the limitations of the research study and possible future research that can stem from this treatise. A Structural Overview of Chapter 6 is presented in Figure 6-2.
Figure 6-1 Chapter 6 RQs and ROs
6.2 Summary of the Research

The research study constituted various research questions that were identified and analysed in order to address the main research question. The following sub-section will discuss these research questions.

6.2.1 Main Research Question (RQM) and Main Research Objective (RO_M)

The Main Research Question of the research study was stated as; “What information is required by dairy farmers to be included as Information as a Service?”. In order to analyse the main research problem effectively, the following seven research questions (RQ_1 to RQ_7), based on the secondary research objectives, had to be answered first:

RQ_1 - What are the different communication strategies by which organisations communicate with dairy farmers?
RQ_2 - What time frame would be most suitable when communicating with dairy farmers?
RQ_3 - How can an organisation best communicate with dairy farmers?
RQ_4 - What technologies are dairy farmers using to access information at present?
RQ_5 - What information do dairy farmers require?
RQ_6 - What research methodology can be used to understand the information required by dairy farmers?
RQ7 - What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?

6.2.2 Research Question (RQ1) and Research Objective (RO1)

The first research question (RQ1) states; “What are the different communication strategies by which organisations communicate with dairy farmers?”. The objective of the question was to identify the different communication strategies available to dairy farmers. Current literature studies were reviewed to find a suitable answer to the identified research question.

The literature reviews identified that communication strategies can vary from Self-Help Groups to Mobile Technology (Rahman & Gupta, 2015). The type of communication strategy will depend on the systems that an organisation has available for their customers (Curren & Meuter, 2005; Meuter; Ostrom; Roundtree & Bitner, 2000). In the past, information that organisations shared with their customers was very limited but this has changed with the availability of Information and communication systems. Dairy farmers need to belong to study groups or have the required technology for organisations to communicate with them. The chapter concluded that an organisation can also communicate with dairy farmers by means of its ICT system.

6.2.3 Research Question (RQ2) and Research Objective (RO2)

The second research question (RQ2) states; “What time frame would be most suitable when communicating with dairy farmers?”. The objective of the question was to determine the appropriate time frames in which to communicate with dairy farmers. Current literature studies were reviewed to find a suitable answer to the identified research question.

The timing of communication with dairy farmers needs to be well planned and depends, according to literature, on the type of social networking the organisation might use (Gillet, 2014). Different networks have different times that will be more suitable to communicate in. The chapter concluded that the time frame that will be the best to communicate to dairy farmers will be the one that will be most convenient for dairy farmers (Diekmann; Loibl & Batte, 2009).
6.2.4 Research Question (RQ3) and Research Objective (RO3)

The third research question (RQ3) states; “How can an organisation best communicate with dairy farmers?”. The objective of the chapter was to identify Best Business Practice for communication with dairy farmers. Current literature studies were reviewed to find a suitable answer to the identified research question.

Organisations that deal with dairy farmers need to decide which Social Media site best suits them when they need to communicate with their dairy farmers (Jones, et al., 2010). The Social Media site that an organisation utilises will depend on the type of technology that the organisation uses and the time frame that it wants to communicate in (Diekmann, et al., 2009). Dairy farmers will use the social media that utilise the preferred technology that dairy farmers in general utilise (Simpson, 2014). The chapter concluded that Facebook will probably be one of the preferred social media services, because dairy farmers can create groups (Rouse, 2014). Organisations can also create groups through which they can communicate with dairy farmers.

6.2.5 Research Question (RQ4) and Research Objective (RO4)

The fourth research question (RQ4) states; “What technologies are dairy farmers using to access information at present?”. The objective of the chapter was to identify the technologies used by dairy farmers. Current literature studies were reviewed to find a suitable answer to the identified research question.

The technology used to access information consist of Laptops, Smart Phones, Tablets and Desktops (Aker & Mbiti, 2010). The type of technology used by a dairy farmer will depend on the preferred technology that the dairy farmers are comfortable with. Dairy farmers have adopted the usage of smartphones from which they can do virtually all their business (Andersson, 2012). The chapter concluded that agricultural organisations will need to pay attention to the development of agricultural applications that can be used with the technology that dairy farmers are accessing information (Simpson & Calitz, 2014).

6.2.6 Research Question (RQ5) and Research Objective (RO5)

The fifth research question (RQ5) states; “What information do dairy farmers require?”. The objective of the question was to identify the information required by dairy farmers.
Current literature studies were reviewed to find a suitable answer to the identified research question.

The information that agricultural organisation provide to dairy farmers needs to give them the correct guidance in performing good farming practices in order to produce safe, quality milk (FAO & IDF, 2011). Dairy farmers can adopt any of these guidelines depending on their own situations. Dairy farmers will not be legally bound to these guidelines, but they will ensure that dairy farmers make the correct decisions for their farming enterprises (FAO & IDF, 2011). The chapter concluded that dairy farmers require information on the following aspects: Animal Health, Milk Hygiene, Nutrition (Feed and Water), Animal Welfare, The Environment and Socio-economic Management.

6.2.7 Research Question (RQ6) and Research Objective (RO6)

The sixth research question (RQ6) states; “What research methodology can be used to understand the information required by dairy farmers?”. The objective of the question was to establish a research methodology that will provide clarity on what information services dairy farmers require. Current practices in research methodology were reviewed and suitable research methodologies applicable to this research study were extracted and presented.

The chapter highlighted the research design with reference to the research onion defined by Saunders, et al., (2012). Thereafter, the chapter continued to discuss what is meant by research and then acknowledged the two research paradigms (Saunders, et al., 2012). The research paradigm selected for this study is a mixed method approach. Furthermore, the survey designs, survey respondents and data collection and analysis methods exploited were discussed. The statistical methods used in this study were then discussed followed by cross-sectional studies and how they relate to this study. The limitations of the research methodology were then presented. The chapter concluded with a discussion on the reliability and validity of this research study.

6.2.8 Research Question (RQ7) and Research Objective (RO7)

The seventh research question (RQ7) states; “What are the components of a communications framework for agricultural organisations to provide Information as a
Service to dairy farmers?”. The objective of the chapter was to propose a communication framework for dairy farmers using Information as a Service. Current literature studies were reviewed to find a suitable answer to the identified research question. From these findings, an IaaSDFS was compiled and distributed to dairy farmers in South Africa. The IaaSDFS focused on determining what information is required by dairy farmers and how dairy farmers access the Internet. The findings were analysed and presented in Chapter 5. The findings will constitute a proposed Communication Framework for Dairy Farmers using Information as a Service.

6.3 Recommendations and Considerations

Based on the empirical study conducted, it is apparent that there is scope for agricultural organisations to supply dairy farmers with the required information that they need through Information as a Service. The information supplied by agricultural organisations will assist dairy farmers in their decision making process to achieve their goals in their farming operations. The researcher proposes the following recommendations and considerations for successful re-alignment:

- There are two groups of dairy farmers. The groups exist, because of the different farming practices that they use. There are dairy farmers milking on a pasture system and dairy farmers milking on a TMR system;
- The information required by each of these groups of dairy farmers differs. Agricultural organisations need to supply both these groups with the relevant information that they require;
- Agricultural organisations must align their technical and operational policies to meet business needs as well as the customer requirements;
- Agricultural organisations should encourage dairy farmers to belong to groups through which these organisations can communicate with the dairy farmers;
- The communication strategies of agricultural organisations must be aligned with the communication technologies that are used by dairy farmers. Therefore, the message must speak to the audience, the farmers, and must reach them in their preferred channel of communication;
- The time frame in which communication to dairy farmers takes place needs to be aligned with their needs. Therefore, the type of Social Media used by
agricultural organisations need to apply to the time frame most suitable to communicate to dairy farmers;

- Information made available to the two groups of dairy farmers must be accurate and relevant according to their requirements;

- Agricultural organisations must share information that is not relevant to the organisation such as the weather forecast on their websites. Dairy farmers visit the websites of organisations, because they receive more information from the website than their actual requirements;

- Agricultural organisations need to pay attention to the creation of applications for dairy farmers that meet their requirements; and

- Agricultural organisation must keep the information that they share with dairy farmers up to date with the newest developments in dairy farming.

6.4 Proposed Communication Framework for Dairy Farmers

The proposed Communication Framework for Dairy Farmers is presented in Figure 6-3. The framework is based on the findings presented in Chapter 5 and described in Section 6.3. The framework adapts a top-down approach that starts at the South African Agricultural Environment, and works its way down until the component on information required is reached. The information required feeds back to the beginning where the process starts all over again at the South African Agriculture Environment. The different components of the framework are connected with each other and are directly influenced by any form of change made to the Information as a Service for Dairy Farmers. Therefore, it is clear that no section of the framework can be viewed in isolation.

The heart of the proposed Communication Framework for Dairy Farmers is the South African Agriculture Environment. The Information that dairy farmers finally require to make the correct decisions in their farming operations stems from what is allowed by the South African Agriculture Environment. The second section is the Agriculture organisation. Agriculture Organisations need to operate in the South African Agriculture Environment. The Agriculture Organisations have their own communication strategies that they follow to communicate with their dairy farmers. The communication strategy component of an agricultural organisation has an internal- and external environment. The internal environment consists of two sections,
namely, Best Business Practice for Communication and Communication Time Frames. The external environment consists of two sections, namely, Devices Used and Information Required. The information flows from these components to the Information as a Service for Dairy Farmers component and back to these components. The Information as a Service component in its turn feeds information back to the South African Agriculture Environment. The Information Required component feeds information back as well to the beginning namely: the South African Agriculture Environment.
Figure 6-3 Communication Framework for Dairy Farmers
The following sub-sections discuss each of the components of the Communication Framework for Dairy Farmers in more detail:

- **South African Agriculture Environment**

  The South African Agriculture Environment is at the heart of the framework. The South African Agriculture Environment identifies the measurable goals and objectives of the agricultural organisation. The South African Agriculture Environment will be influenced by the Political-, Economical-, Social-, Technological-, Legal- and Environmental situation. The commitment of top management of an agricultural organisation will be incorporated at this level.

- **Agricultural Organisation**

  The second component of the Communication Framework for Dairy Farmers is the agricultural organisation. The agricultural organisation will identify the kind of communication strategy that the organisation will follow. The communication strategy will remain in the boundaries set by the South African Agricultural Environment.

  The agricultural organisation can be any organisation that is doing business with a dairy farmer in the agricultural field.

- **Communication Strategies**

  The third component of the Communication Framework for Dairy Farmers is the communication strategies. The communication strategies that an agricultural organisation will follow will depend on the type of communication technologies that the agricultural organisation uses (Curren & Meuter, 2005; Meuter; Ostrom; Roundtree & Bitner, 2000). Dairy farmers may belong to SHGs through which the agricultural organisation can communicate with the dairy farmer (Rahman & Gupta, 2015). The information that organisations shared with their customers was very limited in the past, this has changed with the availability of ICT systems that organisations use. Agricultural organisations normally use their ICT systems to communicate with dairy farmers. Mobile phones are another option by which organisations can communicate with dairy farmers.
The strategy that an organisation chooses to use must be able to interact with the technology that is available to the dairy farmer. The communication strategy used by the agricultural organisation to communicate with the dairy farmer will be made available through the Information as a Service. The Information as a Service will need to be updated with the most recent communication strategies that an agricultural organisation may use.

- Best Business Practice for Communication

The fourth component of the Communication Framework for Dairy Farmers is the Best Business Practice for Communication. The Best Business Practice for Communication is an internal environment of the communication strategy that an organisation may follow. Organisations will be able to manage the internal environment. The best way of communication with dairy farmers will depend on the type of social media that an organisation chooses to use (Jones, et al., 2010). The social media will depend on the type of technology that organisations and dairy farmers use to access information on the Internet (Simpson, 2014). The social media used by organisations to communicate with dairy farmers will depend on the time frames that the organisation chooses to communicate with the dairy farmer. Facebook may be one of the more popular social media sites, because of the groups that can be created by either the organisation or the dairy farmer.

The best business practice for communication used by an agricultural organisation to communicate with dairy farmers will be made available through the Information as a Service. The Information as a Service will need to be updated with the most recent, best business practices for communication that an agricultural organisation may use.

- Communication Time Frames

The fifth component of the Communication Framework for Dairy Farmers is communication time frames. Communication time frames is part of the internal environment that organisations use to communicate with dairy farmers. The communication time frames that agricultural organisations use to communicate with dairy farmers will depend on the social media that agricultural
organisations choose to use (Gillet, 2014). The most convenient communication time frame will be the one that is the most suitable for dairy farmers to communicate in (Simpson, 2014).

The communication time frames used by the agricultural organisation to communicate with the dairy farmer will be made available through the Information as a Service. Information as a Service will need to be updated with the most recent communication time frames that an agricultural organisation may use.

**Devices Used**

The sixth component of the Communication Framework for Dairy Farmers is devices used. Devices used is part of the external environment that organisations use to communicate with dairy farmers. The external environment that is not managed by an organisation but it is influenced by external factors. The technology used to access information by dairy farmers can vary from a mobile phone to a tablet (Aker & Mbiti, 2010). The devices used will depend on the technology that dairy farmers feel comfortable with. Dairy farmers have adopted the smart phone that they can use to do virtually all their business (Andersson, 2012).

The devices used by an agricultural organisation to communicate with dairy farmers will be made available through the Information as a Service. The Information as a Service will need to be updated with the most recent devices used by agricultural organisations.

**Information Required**

The seventh component of the Communication Framework for Dairy Farmers is information required. The information required is part of the external environment that organisations use to communicate with dairy farmers. The information that agricultural organisation provide to dairy farmers needs to give them the correct guidance in performing good farming practices in order to produce safe, quality milk (FAO & IDF, 2011). Dairy farmers can adopt any of these guidelines depending on their own situation. Dairy farmers will not be legally bound to these guidelines, but they will ensure that dairy farmers make

The information required by an agricultural organisation to communicate with the dairy farmer will be made available through the Information as a Service. The Information as a Service will need to be updated with the most recent information required by dairy farmers.

The Information as a Service for Dairy Farmers and the information required by dairy farmers feeds back to the South African Agricultural Environment, where the process starts again from the beginning.

6.5 Limitations of the Study

Limitations are shortcomings, conditions or influences that are outside the control of the researcher that may place restrictions on the research study. The following are limitations that have been identified in this research study:

- Absence of the interviewer while the respondents had to complete the questionnaire online (when uncertainty is experienced and there is lack of clarification and probing methods);
- Difficulty in reaching challenging population and problems with cooperation. Respondents, therefore, do not always respond to the communication methods used in order for them to participate in the research study;
- The response rate was adequate, however, a higher response rate would have been more favourable;
- The researcher had to rely on his colleagues to complete questionnaires with their customers in their areas of work. Therefore, the accuracy of the questionnaires may be questionable;
- The questionnaire was sent to dairy farmers in South Africa, but because the researcher lives in the Eastern Cape province, more attention was given to the Eastern Cape province;
- The cross-sectional study only includes the current state of affairs at the time of the set timeframe. Anything before and after the snapshot is excluded;
• Due to time constraints, some areas may not have received the researcher’s full and undivided attention as he would have liked;
• Respondents may not feel encouraged to provide honest and accurate answers; and
• Misinterpretation of questions. Therefore, it would have been more favourable to complete each questionnaire in person with the respondents.

6.6 Future Research

During the course of this research study, a number of future research possibilities have been identified that will assist future researchers to strengthen the findings as presented. The following opportunities have been identified:

• Split the two groups of dairy farmers (milking on a pasture system and milking from a TMR system) with the IaaSDFS and determine the information required for each group individually;
• More attention needs to be paid to the other provinces in South Africa, where dairy farmers are actively farming and cross-reference these findings with the IaaSDFS findings; and
• More time can be spent on the detailed information that dairy farmers require.

6.7 Summary

The main objective of the research study was to identify a proposed Communication Framework for Dairy Farmers using Information as a Service. The deliverables set to achieve the main objective included:

• Identify a list of different communication strategies for dairy farmers.
• Identify suitable time frames to communicate with dairy farmers.
• Identify the best ways to communicate with dairy farmers.
• Identify a list of technologies used by dairy farmers to access information.
• Identify a list of information required by dairy farmers.
• Identify the research methodology applied in this research study.
• Identify the components that will constitute a proposed Communication Framework for Dairy Farmers using Information as a Service.
The research study concluded with the identification of a list of recommendations and considerations that stem from the IaaSDFS findings. In addition, a proposed Communication Framework for Dairy Farmers using Information as a Service was presented. The purpose of the Communication Framework for Dairy Farmers is to provide a high level of understanding of each topic or area within the Information as a Service landscape and provide a basic relationship which joins the topics or area together. Therefore, the proposed Communication Framework for Dairy Farmers using Information as a Service provides a holistic view of the agricultural organisation’s resource landscape. The proposed Communication Framework for Dairy Farmers using Information as a Service will assist agricultural organisations to re-align their information required by dairy farmers. The re-alignment of information by agricultural organisations will ensure that both the needs of business as well as the requirements of dairy farmers are met, whilst receiving optimal value from the instilled Information on a continuous basis.
Bibliography


Hofstee, E., 2006. *Constructing a Good Dissertation: A Practical Guide to Finishing a Master's, MBA or PhD on Schedule.* Johannesburg: EPE.


Appendix A: Research Alignment Plan

<table>
<thead>
<tr>
<th>Title: Information as a Service for Dairy Farmers.</th>
</tr>
</thead>
</table>

**Main Research Problem:** Dairy Farmers find it difficult to access and obtain the information they require in a timeous, relevant and personalised manner to make the necessary farming related decisions.

**Thesis Statement:** A proposed Information Services Framework can improve communication services and the quality of Extension Services to the dairy farmers and provide improved customer service.

**Main Research Objective (RO_M):** Identify the information requirements of dairy farmers for farming-related decision making.

**Main Research Question (RQ_M):** What information is required by dairy farmers to be included as Information as a Service?

<table>
<thead>
<tr>
<th>Secondary Research Questions</th>
<th>Research Objectives</th>
<th>Chapter</th>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify the problem.</td>
<td>Chapter 1 – Introduction and Problem Statement</td>
<td>Story line, background and layout of chapters.</td>
<td></td>
</tr>
<tr>
<td>RQ</td>
<td>Question</td>
<td>Chapter 2 – Communication Strategies for Dairy Farmers</td>
<td>Chapter 3 – Technology Used by Dairy Farmers</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>RQ1</td>
<td>What are the different communication strategies by which organisations communicate with dairy farmers?</td>
<td>Identify the different communication strategies available to dairy farmers.</td>
<td>Identify the technology used by dairy farmers.</td>
</tr>
<tr>
<td>RQ2</td>
<td>What time frame would be most suitable when communicating with dairy farmers?</td>
<td>Determine the appropriate time frames in which to communicate with dairy farmers.</td>
<td>Identify the information required by dairy farmers.</td>
</tr>
<tr>
<td>RQ3</td>
<td>How can an organisation best communicate with dairy farmers?</td>
<td>Identify Best Business Practice for communication with dairy farmers.</td>
<td></td>
</tr>
<tr>
<td>RQ4</td>
<td>What technologies are dairy farmers using to access information at present?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RQ5</td>
<td>What information do dairy farmers require?</td>
<td>Identify the information required by dairy farmers.</td>
<td></td>
</tr>
</tbody>
</table>

**Chapter 2 – Communication Strategies for Dairy Farmers**

**Chapter 3 – Technology Used by Dairy Farmers**
<table>
<thead>
<tr>
<th>RQ&lt;sub&gt;6&lt;/sub&gt;</th>
<th>What research methodology can be used to understand the information required by dairy farmers?</th>
<th>Establish a research methodology that will provide clarity on what information service dairy farmers require.</th>
<th>Chapter 4 – Research Design and Methodology</th>
<th>Research Methodology – The way in which the research will be conducted</th>
</tr>
</thead>
<tbody>
<tr>
<td>RQ&lt;sub&gt;7&lt;/sub&gt;</td>
<td>What are the components of a communications framework for agricultural organisations to provide Information as a Service to dairy farmers?</td>
<td>Propose a communication framework, using Information as a Service, for dairy farmers.</td>
<td>Chapter 5 – Proposed Communication Framework for Dairy Farmers</td>
<td>Surveying and findings – Framework to use when communicating with dairy farmers.</td>
</tr>
<tr>
<td>RO&lt;sub&gt;M&lt;/sub&gt;</td>
<td>What information is required by dairy farmers to be included as Information as a Service?</td>
<td>Identify the information requirements of dairy farmers for farming-related decision making.</td>
<td>Chapter 6 – Recommendations and Conclusion</td>
<td>Conclusions, recommendations and future research.</td>
</tr>
</tbody>
</table>
Appendix B: Research Ethics Approval Form E

ETHICS CLEARANCE FOR TREATISES/DISSERTATIONS/THESES

Please type or complete in block ink

FACULTY: Business and Economic Science

SCHOOL/DEPARTMENT: Business School

Surname and initials of supervisor: Calitz, A.P.

Surname and initials of candidate: Hart, J.A.

Student number: 213413507

a candidate for the degree of Masters in Business Administration

with a treatise/dissertation/thesis entitled: Information as a Service for Dairy Farmers

considered the following ethics criteria (please tick the appropriate block):

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Is there any risk of harm, embarrassment of offence, however slight or temporary, to the participant, third parties or to the communities at large?</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2. Is the study based on a research population defined as ‘vulnerable’ in terms of age, physical characteristics and/or disease status?</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

2.1 Are subjects/participants/respondents of your study:

(a) Children under the age of 16? ✓
(b) NMMU staff? ✓
(c) NMMU students? ✓
(d) The elderly/persons over the age of 60? ✓
(e) A sample from an institution (e.g. hospital/school)? ✓
(f) Handicapped (e.g. mentally or physically)? ✓
3. Does the data that will be collected require consent of an institutional authority for this study? (An institutional authority refers to an organisation that is established by government to protect vulnerable people)

4. Will the participant's privacy, anonymity or confidentiality be compromised?

4.1 Are you administering a questionnaire/survey that:
(a) Collects sensitive/identifiable data from participants?
(b) Does not guarantee the anonymity of the participant?
(c) Does not guarantee the confidentiality of the participant and the data?
(d) Will offer an incentive to respondents to participate, i.e. a lucky draw or any other prize?
(e) Will create doubt whether sample control measures are in place?
(f) Will be distributed electronically via email (and requesting an email response)?

Note:
- If your questionnaire DOES NOT request respondents' identification, is distributed electronically and you request respondents to return it manually (print out and deliver/email); AND respondent anonymity can be guaranteed, your answer will be NO.
- If your questionnaire DOES NOT request respondents' identification, is distributed via an email link and works through a web response system (e.g. the university survey system); AND respondent anonymity can be guaranteed, your answer will be NO.

Please note that if ANY of the questions above have been answered in the affirmative (YES) the student will need to complete the full ethics clearance form (REC-H application) and submit it with the relevant documentation to the Faculty RECH (Ethics) representative.

and hereby certify that the student has given his/her research ethical consideration and full ethics approval is not required.

```
SUPERVISOR(S)                                             DATE

HEAD OF DEPARTMENT                                         DATE

STUDENT(S)                                                DATE
```

Please ensure that the research methodology section from the proposal is attached to this form.
Dear Respondent

I am currently completing my MBA at the Nelson Mandela Metropolitan University (NMMU) Business School.

I am in the process of writing my treatise to finalize the MBA studies.

I constructed a questionnaire which has to be completed by farmers in the dairy industry. The information gathered in this questionnaire will assist me to complete the treatise, as well as provide valuable information with regard to potential improvements in the agricultural industry.

I appreciate your taking the time to complete this questionnaire.

Please find the link below:

Kind regards

James Hart
Appendix D: Questionnaire

1. Biographical Details

1.1 What is your age?
   *
   ☐ 35 or younger ☐ Between 36 and 55 ☐ Over 55

1.2 Gender:
   *
   ☐ Male ☐ Female

1.3 Language:
   *
   ☐ Afrikaans ☐ English ☐ Ndebele ☐ Northern Sotho ☐ Sotho ☐
   Swazi ☐ Tsonga ☐ Tswana ☐ Venda ☐ Xhosa ☐ Zulu ☐ Other

1.4 If you chose other at 1.3, please specify:

1.5 What province do you live in?
   *
   ☐ Eastern Cape ☐ Free State ☐ Gauteng ☐ Western Cape ☐ Limpopo
   ☐ Mpumalanga ☐ North West ☐ Northern Cape ☐ KwaZulu-Natal
   ☐ Outside RSA

1.6 If outside RSA, where?

add new question

add new category

Click Next Page to continue
2. Farming Practices

2.1 What breed of cow do you farm with? (Please mark all that apply)
   - Friesland
   - Jersey
   - Ayrshire
   - Brown Swiss
   - Cross Bred
   - Other

2.2 Other breeds: Please list

2.3 What farming system do you use?
   - Pasture
   - Total Mixed Ration (TMR)
   - Partial Mixed Ration (PMR)

2.4 How do you feed concentrates to your cows?
   - In the parlour
   - Post-feeding unit
   - Other

2.5 If stated other in 2.4, please specify:

2.6 Which of the following do you plant?
   - Ryegrass
   - Kikuyu
   - Oats
   - Maize
   - Wheat
   - Sorghum
   - Other

2.7 If stated other in 2.6, please specify:

2.8 Which of the following do you plant to make silage?
   - Ryegrass
   - Kikuyu
   - Oats
   - Maize
   - Wheat
   - Sorghum
   - Other

2.9 If other, please specify:

2.10 What kind of dairy parlour do you milk in?
   - Herringbone
   - Rotary
   - Other

2.11 If stated other in 2.10, please specify:

2.12 How many cows are you milking?
   - 0 - 99
   - 100 - 199
   - 200 - 499
   - 500+

2.13 What method do you use to milk your cows?
   - Manually (by hand)
   - Automatic
2.14 * Which of the following technologies is your dairy parlor equipped with?

- Automatic Cluster Removers
- ALPRD System
- AFIMILK System
- MilkFriend
- Other

2.15 If stated other in 2.14, please specify:

(add new question)

(add new category)

Click Next Page to continue
3. Importance of information to dairy farmers

How important are the following types of information to you as a dairy farmer?

3.1 Weather forecast.
   * Not important 0 1 2 3 4 5 Very important

3.2 Planting date for maize as silage.
   * Not important 0 1 2 3 4 5 Very important

3.3 Information on seed cultivars (Pasture or commercial crops).
   * Not important 0 1 2 3 4 5 Very important

3.4 Information on planting dates for certain pastures.
   * Not important 0 1 2 3 4 5 Very important

3.5 Information on the correct utilisation and management of pastures.
   * Not important 0 1 2 3 4 5 Very important

3.6 Information on total mixed ration systems (TMR).
   * Not important 0 1 2 3 4 5 Very important

3.7 Information on herd health.
   * Not important 0 1 2 3 4 5 Very important

3.8 Information on correct feeding for calves.
   * Not important 0 1 2 3 4 5 Very important

3.9 Guidelines on feeding the dairy cow.
   * Not important 0 1 2 3 4 5 Very important

3.10 Guidelines on feeding the dry cow.
    * Not important 0 1 2 3 4 5 Very important

3.11 Information on important dates in the district.
    * Not important 0 1 2 3 4 5 Very important

3.12 What other information is important?

http://forms.nmmu.ac.za/wiseconry.asp?id=14238k+b51pocuec&design=mode=yes&pi=3
4. Agricultural Organisations Information

Please indicate to what extent you agree with the following statements.

4.1 Agricultural organisations tell me exactly when services will be performed.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.2 Agricultural organisations have convenient operating hours.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.3 I feel safe in my transactions with agricultural organisations' employees.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.4 Agricultural organisations have up-to-date, accurate market information.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.5 Agricultural organisations provide their services at the time they promise to do so.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.6 Agricultural organisations have my best interests at heart.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.7 Agricultural organisations provide me with personalised information.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.8 Agricultural organisations' information is well presented with a neat appearance.
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

4.9 Agricultural organisation's information is
   * strongly disagree ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 strongly agree

http://formm.nmmu.ac.za/websurvey/q.asp?id=1422481t&fipcoocldesignmode=yes&p=4
systematically and methodically presented.

4.10 Employees of agricultural organisations give me personal attention.
- strongly disagree 1 2 3 4 5 strongly agree

4.11 Agricultural organisations' employees are always willing to help me.
- strongly disagree 1 2 3 4 5 strongly agree

4.12 Agricultural organisations' employees are polite.
- strongly disagree 1 2 3 4 5 strongly agree

4.13 I receive prompt service from employees of agricultural organisations.
- strongly disagree 1 2 3 4 5 strongly agree

4.14 Agricultural organisations' employees do know what my needs are.
- strongly disagree 1 2 3 4 5 strongly agree

4.15 Agricultural organisations are dependable.
- strongly disagree 1 2 3 4 5 strongly agree

4.16 Agricultural organisations respond to my requests promptly.
- strongly disagree 1 2 3 4 5 strongly agree

4.17 I trust the information provided by agricultural organisations.
- strongly disagree 1 2 3 4 5 strongly agree

4.18 Agricultural organisations' information is easily accessible.
- strongly disagree 1 2 3 4 5 strongly agree

4.19 It appears that agricultural organisations keep accurate records.
- strongly disagree 1 2 3 4 5 strongly agree

4.20 When I have a problem, agricultural organisations are sympathetic and reassuring.
- strongly disagree 1 2 3 4 5 strongly agree

add new question
add new category

Click Next Page to continue
5. Customer Satisfaction – De Heus

If you are currently a De Heus customer, please complete section 5. If you are not a De Heus customer, please continue to section 6.

Please indicate to what extent you agree with the following statements.

5.1 De Heus tell me exactly when services will be performed.

5.2 De Heus have convenient operating hours.

5.3 I feel safe in my transactions with De Heus employees.

5.4 De Heus have up-to-date, accurate market information.

5.5 De Heus provide their services at the time they promise to do so.

5.6 De Heus have my best interests at heart.

5.7 De Heus provide me with personalised information.

5.8 De Heus information is well presented with a neat appearance.

5.9 De Heus information is systematically and methodically presented.

5.10 Employees of De Heus
5.11 De Heus employees are always willing to help me.
5.12 De Heus employees are polite.
5.13 I receive prompt service from De Heus employees.
5.14 De Heus employees do know what my needs are.
5.15 De Heus is dependable.
5.16 De Heus respond to my requests promptly.
5.17 I trust the information provided by De Heus.
5.18 The information De Heus provides is easily accessible.
5.19 It appears that De Heus keep accurate records.
5.20 When I have problems, De Heus is sympathetic and reassuring.

Our Web Survey - edit questionnaire

add new question
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6. Internet Usage

If you are using the Internet, please tell us about your use thereof.

6.1 Where are you most often when you use the Internet?
- Home
- Outside
- Restaurant / Internet Cafe
- Work
- Other

6.2 If stated other in 6.1, please specify:

6.3 What devices do you use to access the Internet?
(Please check all that apply)
- Laptop
- Mobile Phone
- PC
- Tablet
- Other

6.4 If stated other in 6.3, please specify:

6.5 Which type of Internet connection do you have?
(Please check all that apply)
- ADSL
- Mobile
- Wireless
- Satellite
- None
- Other

6.6 If stated other in 6.5, please specify:

6.7 On average, how many days per week do you access the Internet?
- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

6.8 How many hours on average do you spend on the Internet per day?
- 0
- 1-2
- 3-4
- 5-6
- 6+

6.9 What do you use the Internet for? (Please check all that apply)
- Email
- Banking
- News
- Social media - Facebook, Twitter etc.
- Games
- Information
- Sport Results
- Other

6.10 If stated other in 6.9, please specify:

6.11 Could you conduct your
* business without the Internet?

○ Yes ○ No ○ Don't know

add new question
add new category

Click Next Page to continue
7. Mobile Device Usage

Please tell us about your cell phone (mobile device) use.

7.1 Who is your service provider?
* ☐ Vodacom ☐ MTN ☐ Cell C ☐ Telkom Mobile ☐ Virgin Mobile ☐ Other

7.2 If stated other to 7.1, please specify:

7.3 Do you use your mobile phone for Internet?
☐ Yes ☐ No

7.4 What do you use your mobile phone for? (Please check all that apply)
☐ Phoning ☐ SMS ☐ Taking Photos ☐ Messaging: BBM, WhatsApp, etc. ☐ Email ☐ Business ☐ Social media - Facebook, Twitter, etc. ☐ Games ☐ Apps ☐ Other

7.5 If stated other to 7.4, please specify:

7.6 What make of mobile phone do you have?
☐ Apple ☐ Blackberry ☐ HTC ☐ Nokia ☐ Samsung ☐ Sony Ericsson ☐ Other

7.7 If stated other to 7.6, please specify:

7.8 Could you conduct your business without your mobile phone?
☐ Yes ☐ No ☐ Don’t know

7.9 Do you have a tablet?
☐ Yes ☐ No

7.10 If you have a tablet, what make of operating system does it have?
☐ Apple OS ☐ Android ☐ Microsoft Windows ☐ Other

7.11 If stated other to 7.10, please specify:

http://forms.nmmu.ac.za/webSurvey/s.asp?id=14288&c=dtftpcooe&designmode=yes&p=7
5/21/2015

7.12 If you have a tablet, what do you use it for? (Please check all that apply)

☐ email  ☐ Banking  ☐ Business  ☐ News  ☐ Apps  ☐ Games  ☐ Information  ☐ Sports Results  ☐ eBooks  ☐ Social media - Facebook, Twitter, etc.  ☐ Other

7.13 If stated other to 7.12, please specify:

7.14 Could you run your business without your tablet?

☐ Yes  ☐ No  ☐ Don’t know

add new question
add new category

Click Next Page to continue
8. Application (Apps) Usage

If you have installed apps on your mobile devices please complete this section

8.1 Which type of apps do you currently have on your mobile devices? (Please check all that apply)

☐ Utility apps - Calculate, Convert, Translate, etc.
☐ Entertainment apps
☐ Games apps
☐ News apps
☐ Banking apps
☐ Productivity apps - Calendar, To do list, etc.
☐ Social Media - Facebook, Twitter, etc.
☐ Other

8.2 If stated other in 8.1, please specify:

☐ All of them
☐ Most of them
☐ About half of them
☐ Some of them
☐ None of them

8.3 Of the apps you currently have on your mobile devices, about how many were free?

☐ Utility apps - Calculate, Convert, Translate, etc.
☐ Entertainment apps
☐ Games apps
☐ News apps
☐ Banking apps
☐ Productivity apps - Calendar, To do list, etc.
☐ Social Media - Facebook, Twitter, etc.
☐ Travel apps
☐ Weather apps
☐ Financial Instruments - Stock market, Commodity prices, etc.
☐ Other

8.4 In a typical day which type of apps do you use on your mobile devices most often? (Please check all that apply)

☐ Utility apps - Calculate, Convert, Translate, etc.
☐ Entertainment apps
☐ Games apps
☐ News apps
☐ Banking apps
☐ Productivity apps - Calendar, To do list, etc.
☐ Social Media - Facebook, Twitter, etc.
☐ Travel apps
☐ Weather apps
☐ Financial Instruments - Stock market, Commodity prices, etc.
☐ Other

8.5 If stated other in 8.4, please specify:

add new question
add new category

Click Next Page to continue
9. Dairy Farmers Information Required

9.1 How many days per week do you research different types of market information?

☐ 0  ☐ 1  ☐ 2  ☐ 3  ☐ 4  ☐ 5  ☐ 6  ☐ 7

9.2 Which sources of information do you find most useful?

☐ Landbouweekblad  ☐ Farmer’s Weekly  ☐ Dairy Mail  ☐ Newspapers
☐ TV  ☐ Kyknet  ☐ Internet  ☐ Other

9.3 If stated other in 9.2, please specify:


9.4 Which market indicators do you research?

☐ Rand/Dollar  ☐ Cbot  ☐ Milk Price  ☐ Maize Price  ☐ Gold Price  ☐ Oil Price  ☐ Other

9.5 If stated other in 9.4, please specify:


9.6 What do you think is more important?

☐ Fundamental Analysis  ☐ Technical Analysis  ☐ Both equally  ☐ Neither important

add new question
add new category

Click Next Page to continue
10. Personal Details

If you would like feedback from this survey, please complete the following section.

10.1 Name

10.2 Telephone Number

10.3 E-mail address

The information provided by you will be treated confidentially and not shared with anyone. Summary information may be published.
Appendix E: Turnitin Report

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